



NSW COASTAL RAINFALL ANNUAL SUMMARY 2017–2018

Report MHL2619
November 2018

Prepared for:

NSW Office of Environment and Heritage

Cover photograph: Cudgera rainfall station, Tweed River region

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Document Control

Issue/ Revision	Author	Reviewer	Approved for Issue	
			Name	Date
Draft	B Tse	S Dakin	A Joyner	26 Oct 2018
Final	B Tse	M Fitzhenry, OEH	M Galloway	22 Nov 2018

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Report No. MHL2619

ISSN: 2205-5568 (Print)

ISSN: 2205-5576 (Online)

First published November 2018



Manly Hydraulics Laboratory is Quality System Certified to AS/NZS ISO 9001:2008.

Foreword

Manly Hydraulics Laboratory is a business group within the Department of Finance, Services and Innovation. The NSW rainfall database has been developed to support a number of NSW Office of Environment and Heritage (OEH) programs associated with coastal, floodplain and estuary management. The monitoring service is available to local government and other organisations, both in Australia and overseas.

This annual summary presents the results of rainfall monitoring obtained by the automatic rainfall recording stations along the coastal estuaries and rivers of New South Wales over the period 1 July 2017 to 30 June 2018, and catalogues data collected in NSW by Manly Hydraulics Laboratory.

This summary has been prepared to provide ready access to Manly Hydraulics Laboratory's rainfall database and its data analysis capabilities.

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Report No. MHL2621
ISSN: 2205-5606 (Print)
ISSN: 2205-5614 (Online)

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Executive summary

This report contains:

- a brief description of the coastal rainfall monitoring program
- guidelines on how to use this report
- information on how to access the database
- a review of significant program developments and rainfall events in 2017–2018
- a list of all stations for which Manly Hydraulics Laboratory collected rainfall data in 2017–2018 ([Table 5.1](#))
- the annual data summaries for each station
- [Appendix A](#), which details the rainfall data available
- [Appendix B](#), outlining some of the data analysis suites and presentation formats available
- [Appendix C](#), a list of publications which may be of interest.

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1. Rainfall monitoring program

This report presents the thirty-third year of rainfall data collected by Manly Hydraulics Laboratory (MHL). The network of automatic recorders and the associated analysis routines enable efficient delivery of near real time rainfall data from stations across NSW. Extracts from the historical database of rainfall data can also be made available on request (refer to [Appendix A](#)).

The present program is based on a network of automatic rainfall recording stations installed at various coastal sites (see Section 5 [Station Location Maps](#)). The network consists of 73 permanent stations funded by OEH and this network supplements the coverage provided by the Bureau of Meteorology's rainfall network. The system utilises 0.2 mm, 0.5 mm and 1.0 mm tipping buckets and data loggers, as shown in [Figure 1](#).

Rainfall data is transferred to MHL's databases, located in the NSW Government Data Centre, using a variety of telemetry techniques including internet protocols (IP), landline telephone, cellular networks and event-reporting radio telemetry system (ERTS). The incoming raw data is then made available in near real time to external users to view online as schematised in [Figure 2](#).

Data is stored in a database and subject to a quality assurance process which involves several control steps to maintain data quality as well as assignment of data quality codes. Computer programs are used to further format and analyse data.

Data is backed up daily and archived to magnetic tape as a security measure at regular intervals, and copies are stored off site.

2. How to use this report

This report aims to streamline access to MHL's services and to the rainfall database.

The NSW coastline has been divided into geographic regions based on river systems. Location maps display the station locations and the annual plots confirm the availability and suitability of data for the particular period of interest. A list of rainfall station data collected and stored online is included in [Appendix A](#).

Once a choice has been made of the period for which information is required, data and services can be obtained in a variety of formats, according to their intended use. All data presented in this report are in Australian Eastern Standard Time (EST). Allowance for daylight saving time needs to be made by the user of the data if required

[Appendix B](#) provides examples of data analysis and presentation formats available from MHL. Available rainfall products include:

Tabulated output

- daily totals
- intensity/duration tables
- time of tips of rain gauge or short period fixed time step data.

Graphical plots

- hourly, daily, monthly and yearly hyetographs (a graphical representation of rainfall distribution over a period of time)
- intensity-frequency-duration curves.

3. How to access the data

MHL provides a full online data access service via the internet for its clients, and a restricted service for the general public at <http://www.mhl.nsw.gov.au/>.

Typically the last seven days of data are available online in a non-quality controlled form to aid the fastest possible access to data records. The online service for clients can provide access to all data catalogued in [Appendix A](#).

Quality controlled data may be ordered via the MHL web page (<http://www.mhl.nsw.gov.au/>), by emailing data-request@mhl.nsw.gov.au, or via customised decision support tools that can be provided on request.

4. Significant events and developments

This section outlines events and developments which have influenced rainfall data monitoring during the 2017–2018 reporting period.

The following stations were upgraded during the fiscal year:

- Cudgera – station relocated at landowner request
- Newports Creek – station relocated away from tree cover
- Dombarton Loop – full station rebuilt due to vandalism
- Port Kembla – rain gauge bucket replaced
- Wongawilli – old instrument housing replaced and rewired
- Darkes Road – old instrument housing replaced and rewired
- Cleveland Road – old instrument housing replaced and rewired
- Nurrewin – old instrument housing replaced and rewired.

In the 2017–2018 fiscal year, the maximum recorded rainfall intensities for 11 durations between 5 minutes and 72 hours occurred at three different stations across the OEH rainfall network ([Table 4.1](#)). To determine the significance of a rainfall event, the intensities are compared against the Annual Exceedance Probability (AEP), where the AEP is the probability of an event occurring in any one year at a particular duration. An event with a 1% AEP (or the 100-year rainfall) is an event that has a 1% chance of being equalled or exceeded in any one year.

A summary of rainfall events for each month during 2017–2018 on the NSW east coast is provided in [Table 4.2](#). 100 mm of rain falling in a 24-hour period is adopted to define a significant rain event.

The maximum recorded rainfall for durations of 5 minutes to 72 hours at each station for 2017–2018 is presented in [Table 4.3](#).

Table 4.1 Maximum recorded intensities for all stations

Duration	Station	Date	Rainfall (mm)	Rainfall (mm/hr)	AEP (%)
5min	Aldavilla Downstream	14/10/2017	17.0	204.0	~10
10min	Aldavilla Downstream	14/10/2017	29.0	174.0	~5
20min	Utungun	14/10/2017	46.5	139.5	~5
30min	Utungun	14/10/2017	61.5	123.0	~2
60min	Lake Ainsworth	5/11/2017	98.0	98.0	~1
3hrs	Utungun	14/10/2017	125.5	41.8	~2
6hrs	Perry Drive	14/10/2017	144.5	24.1	~20
12hrs	Tuncurry Downstream	21/03/2018	190.5	15.9	~2
24hrs	Tuncurry Downstream	22/03/2018	198.5	8.3	~10
48hrs	Tuncurry Downstream	23/03/2018	324.0	6.8	~2
72hrs	Tuncurry Downstream	24/03/2018	373.5	5.2	~2

Table 4.2 2017–2018 Summary of rainfall events

Month	Summary of rainfall events
July 2017	Daily rainfall exceeding 100 mm in 24 hours has occurred at one station in the Tweed River region and one station in the Brunswick River region.
August 2017	No events exceeding 100 mm in 24 hours have occurred this month.
September 2017	No events exceeding 100 mm in 24 hours have occurred this month.
October 2017	Daily rainfall exceeding 100 mm in 24 hours has occurred at five stations in the Bellinger River region, one station in the Nambucca River region and one station in the South Coast region.
November 2017	Daily rainfall exceeding 100 mm in 24 hours has occurred at one station in the Richmond River region, two stations in the Wollongong Coastal region and one station in the South Coast region.
December 2017	Daily rainfall exceeding 100 mm in 24 hours has occurred at one station in the Hastings River region and one station in the Camden Haven River region.
January 2018	No events exceeding 100 mm in 24 hours have occurred this month.
February 2018	Daily rainfall exceeding 100 mm in 24 hours has occurred at one station in the Tweed River region, two stations in the Brunswick River region and one station in the Hawkesbury River region
March 2018	Daily rainfall exceeding 100 mm in 24 hours has occurred at one station in the Brunswick River region, four station in the Bellinger River region, one station in the Macleay River region, two stations in the Camden Haven River region, two stations in the Hunter River region and one station in the Macquarie-Tuggerah Lakes region.
April 2018	No events exceeding 100 mm in 24 hours have occurred this month.
May 2018	Daily rainfall exceeding 100 mm in 24 hours has occurred at one station in the Karuah River region.
June 2018	No events exceeding 100 mm in 24 hours have occurred this month.

Table 4.3 2017–2018 Maximum recorded rainfall (mm)

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Cudgera	1/01/2018 10.0	1/01/2018 12.0	24/02/2018 18.0	24/02/2018 25.5	24/02/2018 35.0	24/02/2018 75.0	24/02/2018 123.5	24/02/2018 144.0	24/02/2018 152.5	24/02/2018 188.5	26/02/2018 197.5	1154.0
Main Arm	26/02/2018 11.5	26/02/2018 19.5	26/02/2018 36.5	26/02/2018 47.0	26/02/2018 52.0	5/03/2018 59.5	24/02/2018 86.0	24/02/2018 100.5	24/02/2018 112.5	24/02/2018 150.0	26/02/2018 169.0	1447.0
Huonbrook	26/02/2018 11.0	26/02/2018 21.0	26/02/2018 29.5	26/02/2018 35.0	26/02/2018 39.5	26/02/2018 45.5	24/02/2018 50.0	24/02/2018 67.5	24/02/2018 93.0	24/02/2018 145.5	17/10/2017 165.0	1650.5
Myocum	25/12/2017 10.5	25/12/2017 17.5	5/03/2018 24.0	5/03/2018 30.0	25/12/2017 37.0	25/12/2017 61.5	25/12/2017 65.0	24/03/2018 81.5	24/03/2018 105.0	24/03/2018 127.5	26/02/2018 149.0	1375.5
Lake Ainsworth	5/11/2017 11.5	5/11/2017 22.0	5/11/2017 41.0	5/11/2017 55.0	5/11/2017 98.0	5/11/2017 110.5	5/11/2017 117.5	5/11/2017 117.5	5/11/2017 117.5	6/11/2017 128.5	8/11/2017 142.5	1448.5
Wooli Caravan Park	13/02/2018 6.0	7/06/2018 11.0	29/11/2017 15.0	7/06/2018 22.5	29/11/2017 34.5	29/11/2017 44.0	7/06/2018 58.5	7/06/2018 78.5	7/06/2018 90.0	7/06/2018 110.5	8/06/2018 114.0	996.5
Perry Drive	14/10/2017 11.5	14/10/2017 23.0	14/10/2017 43.5	14/10/2017 60.5	14/10/2017 76.5	14/10/2017 80.5	14/10/2017 144.5	14/10/2017 189.5	14/10/2017 191.5	16/10/2017 224.0	16/10/2017 228.0	1059.5
Shephards Lane	14/10/2017 9.5	14/10/2017 17.0	14/10/2017 29.0	14/10/2017 45.0	14/10/2017 63.5	14/10/2017 72.5	14/10/2017 95.0	14/10/2017 144.5	14/10/2017 148.0	16/10/2017 183.5	16/10/2017 191.0	1062.0
Red Hill	14/10/2017 8.5	14/10/2017 16.5	14/10/2017 31.5	14/10/2017 46.5	14/10/2017 71.0	14/10/2017 96.0	14/10/2017 108.0	14/10/2017 150.0	14/10/2017 159.0	16/10/2017 190.0	16/10/2017 208.0	1102.5
Newports Creek	5/11/2017 11.0	14/10/2017 19.0	14/10/2017 32.0	14/10/2017 44.0	14/10/2017 69.0	14/10/2017 96.0	14/10/2017 124.5	14/10/2017 142.5	14/10/2017 144.5	16/10/2017 180.5	16/10/2017 186.0	1214.5
Middle Boambee	14/10/2017 14.0	14/10/2017 24.0	14/10/2017 44.0	14/10/2017 58.5	14/10/2017 80.0	14/10/2017 108.5	14/10/2017 134.0	14/10/2017 136.0	14/10/2017 139.0	16/10/2017 152.5	16/10/2017 162.0	1258.0
North Bonville	31/12/2017 9.0	25/02/2017 17.0	25/02/2017 30.0	25/02/2017 32.0	14/10/2017 48.0	14/10/2017 73.5	14/10/2017 82.0	14/10/2017 97.5	7/03/2018 116.5	7/03/2018 127.5	8/03/2017 130.5	1203.0
Kooroowi	2/01/2018 14.0	2/01/2018 26.5	2/01/2018 34.5	2/01/2018 34.5	23/03/2018 47.5	23/03/2018 62.0	23/03/2018 75.5	23/03/2018 93.5	23/03/2018 130.5	23/03/2018 190.0	23/03/2018 194.5	1089.5
Stuarts Island Downstream	24/12/2017 10.5	24/12/2017 18.0	24/12/2017 25.0	24/12/2017 32.0	24/12/2017 33.5	6/03/2018 43.5	6/03/2018 52.5	6/03/2018 75.5	6/03/2018 87.0	23/03/2018 116.0	23/03/2018 122.5	1051.0
Utungun	2/01/2018 15.0	2/01/2018 28.0	14/10/2017 46.5	14/10/2017 61.5	14/10/2017 74.0	14/10/2017 125.5	14/10/2017 131.5	14/10/2017 132.0	23/03/2018 153.5	23/03/2018 192.0	24/03/2018 197.5	1114.0
Aldavilla Downstream	14/10/2017 17.0	14/10/2017 29.0	14/10/2017 39.0	14/10/2017 43.0	14/10/2017 46.0	22/03/2018 54.0	22/03/2018 81.0	22/03/2018 126.0	23/03/2018 189.0	23/03/2018 281.0	23/03/2018 312.0	927.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Green Valley	26/12/2017 11.5	26/12/2017 22.0	26/12/2017 37.0	26/12/2017 51.0	26/12/2017 71.5	26/12/2017 79.0	26/12/2017 79.5	22/03/2018 119.0	22/03/2018 171.0	23/03/2018 285.0	23/03/2018 361.5	1096.0
Telegraph Point ¹	26/12/2017 14.0	26/12/2017 23.0	26/12/2017 37.5	26/12/2017 51.5	26/12/2017 62.0	26/12/2017 70.5	26/12/2017 91.0	26/12/2017 110.5	27/12/2017 148.0	23/03/2018 270.0	24/03/2018 321.0	1185.5
Logans Crossing	26/12/2017 8.0	26/12/2017 15.5	26/12/2017 27.5	26/12/2017 36.5	26/12/2017 61.0	26/12/2017 79.5	26/12/2017 87.5	26/12/2017 128.5	27/12/2017 166.0	23/03/2018 193.5	24/03/2018 226.0	1065.5
Mount George ¹	27/11/2017 11.0	27/11/2017 19.0	27/11/2017 30.5	27/11/2017 39.5	27/11/2017 47.0	21/03/2018 50.0	21/03/2018 68.0	22/03/2018 98.0	22/03/2018 118.0	23/03/2018 199.0	23/03/2018 209.5	725.0
Nabiac	9/01/2018 11.5	9/01/2018 21.0	9/01/2018 32.0	9/01/2018 38.5	9/01/2018 43.0	21/03/2018 69.0	21/03/2018 94.5	21/03/2018 167.5	22/03/2018 174.0	23/03/2018 238.5	24/03/2018 269.5	963.5
Tuncurry Downstream ¹	9/01/2018 11.0	9/01/2018 20.0	9/01/2018 30.0	9/01/2018 37.0	21/03/2018 47.0	21/03/2018 96.5	21/03/2018 282.0	21/03/2018 384.0	22/03/2018 486.0	23/03/2018 324.0	24/03/2018 373.5	868.5
Pacific Palms Wharf ¹	23/03/2018 5.0	23/03/2018 9.5	23/03/2018 13.0	23/03/2018 15.5	23/03/2018 24.5	23/03/2018 45.5	23/03/2018 80.5	23/03/2018 98.0	24/03/2018 126.0	24/03/2018 136.5	24/03/2018 164.0	1017.5
Tarbuck Bay	6/11/2017 12.5	6/11/2017 21.0	6/11/2017 30.0	6/11/2017 33.0	6/11/2017 39.0	23/03/2018 56.5	23/03/2018 94.0	23/03/2018 105.0	24/03/2018 128.5	24/03/2018 136.0	24/03/2018 157.5	1357.0
Bulahdelah	9/01/2018 10.0	9/01/2018 18.0	9/01/2018 22.0	6/03/2018 26.0	6/03/2018 34.0	6/03/2018 46.0	6/03/2018 55.5	21/03/2018 71.0	22/03/2018 81.0	23/03/2018 126.5	24/03/2018 142.0	958.5
Gostwyck	26/10/2017 6.0	25/04/2018 10.0	20/02/2018 15.0	20/02/2018 18.0	20/02/2018 22.5	21/03/2018 42.5	21/03/2018 74.0	21/03/2018 91.0	22/03/2018 114.5	22/03/2018 115.0	23/03/2018 124.0	592.5
Seaham ¹	14/04/2018 5.0	14/04/2018 8.5	19/04/2018 13.5	19/04/2018 15.0	20/02/2018 19.0	20/02/2018 34.0	20/02/2018 44.5	19/06/2018 47.0	20/06/2018 61.0	20/06/2018 71.0	20/06/2018 72.0	610.5
Belmore Bridge	13/02/2018 12.5	13/02/2018 16.0	4/04/2018 20.0	20/02/2018 24.5	21/03/2018 26.5	21/03/2018 46.0	21/03/2018 65.5	21/03/2018 109.0	22/03/2018 140.5	22/03/2018 145.0	23/03/2018 150.0	626.0
Hexham Bridge	26/10/2017 6.5	26/10/2017 11.0	21/03/2018 14.0	21/03/2018 19.0	21/03/2018 24.5	4/04/2018 46.0	4/04/2018 50.0	21/03/2018 76.5	22/03/2018 85.5	22/03/2018 88.0	23/03/2018 94.5	668.0
Barnsley	26/10/2017 7.5	26/10/2017 12.5	26/10/2017 20.0	26/10/2017 29.5	26/10/2017 42.0	21/03/2018 68.5	21/03/2018 93.0	21/03/2018 114.0	22/03/2018 136.0	22/03/2018 152.5	23/03/2018 157.5	765.0
Martinsville	16/11/2017 12.0	16/11/2017 18.5	16/11/2017 26.0	16/11/2017 27.5	16/11/2017 29.0	16/11/2017 30.5	21/03/2018 37.5	21/03/2018 52.0	26/02/2018 72.0	22/03/2018 80.0	23/03/2018 86.5	799.5
Mandalong	16/11/2017 8.5	16/11/2017 12.5	16/11/2017 16.0	16/11/2017 17.0	16/11/2017 19.5	15/10/2017 24.0	15/10/2017 31.5	26/02/2018 45.5	26/02/2018 73.0	26/02/2018 73.5	26/02/2018 73.5	750.5
Wyee	23/10/2017 10.5	23/10/2017 17.5	23/10/2017 22.0	23/10/2017 26.5	23/10/2017 30.5	23/10/2017 36.5	23/10/2017 37.0	26/02/2018 48.5	26/02/2018 81.5	27/02/2018 84.0	27/02/2018 84.0	735.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Whitemans Ridge	26/10/2017 11.5	26/10/2017 19.0	26/10/2017 27.0	26/10/2017 31.5	26/10/2017 36.0	20/02/2018 42.5	20/02/2018 53.5	27/10/2017 54.5	26/02/2018 72.5	27/02/2018 74.0	23/03/2018 75.0	740.5
Yarramalong	7/07/2017 8.0	7/07/2017 15.0	7/07/2017 19.0	7/07/2017 19.0	20/02/2018 22.0	20/02/2018 42.5	20/02/2018 44.5	20/02/2018 45.0	26/02/2018 55.5	26/02/2018 56.5	26/02/2018 56.0	563.0
Kulnura	12/07/2017 8.5	12/07/2017 16.0	12/07/2017 20.5	12/07/2017 20.5	20/02/2018 27.0	20/02/2018 50.5	20/02/2018 54.0	20/02/2018 54.0	26/02/2018 77.5	27/02/2018 80.5	27/02/2018 80.5	671.0
Toukley	6/11/2017 10.5	6/11/2017 11.5	26/10/2017 14.0	27/10/2017 17.0	4/04/2018 27.5	10/06/2018 32.0	10/06/2018 34.0	10/06/2018 37.0	11/06/2018 47.0	6/06/2018 52.0	5/06/2018 70.0	592.5
Hamlyn Terrace	9/01/2018 5.5	4/04/2018 8.0	4/04/2018 11.0	4/04/2018 14.0	4/04/2018 22.5	4/04/2018 33.5	20/02/2018 35.5	26/02/2018 37.5	26/02/2018 63.0	26/02/2018 63.5	5/06/2018 75.0	739.0
Mardi Dam	22/10/2017 10.5	22/10/2017 20.5	22/10/2017 34.0	22/10/2017 39.5	22/10/2017 43.0	22/10/2017 53.0	20/02/2018 54.5	20/02/2018 55.5	26/02/2018 75.5	27/02/2018 77.0	22/10/2017 84.0	706.5
Sterland	26/10/2017 5.5	26/10/2017 10.0	26/10/2017 15.0	2/04/2018 18.5	20/02/2018 21.5	20/02/2018 39.5	20/02/2018 44.0	26/02/2018 57.5	26/02/2018 95.5	27/02/2018 99.0	27/02/2018 99.5	731
Kangy Angy	20/02/2018 7.0	8/01/2018 9.0	2/04/2018 11.0	20/02/2018 13.0	20/02/2018 20.0	20/02/2018 40.0	20/02/2018 45.0	26/02/2018 59.5	26/02/2018 84.5	27/02/2018 87.0	27/02/2018 87.0	705
Berkeley Vale	26/10/2017 7.0	26/10/2017 14.0	26/10/2017 24.0	26/10/2017 28.0	27/10/2017 31.5	27/10/2017 33.5	20/02/2018 39.5	26/02/2018 55.5	26/02/2018 80.0	26/02/2018 82.5	28/02/2018 83.0	722.5
Bateau Bay	8/01/2018 8.0	8/01/2018 10.5	8/01/2018 12.0	2/04/2018 14.5	2/04/2018 18.5	2/06/2018 30.0	3/06/2018 50.5	3/06/2018 67.0	26/02/2018 82.5	6/06/2018 84.5	5/06/2018 121.5	764.0
Lisarow	19/02/2018 6.5	19/02/2018 10.0	20/02/2018 13.5	19/06/2018 14.0	19/06/2018 17.5	20/02/2018 34.5	20/02/2018 39.5	26/02/2018 58.5	26/02/2018 93.0	27/02/2018 96.0	27/02/2018 96.0	798.0
Strickland	22/10/2017 8.5	22/10/2017 16.5	22/10/2017 21.5	22/10/2017 23.5	22/10/2017 26.5	20/02/2018 46.5	20/02/2018 51.5	26/02/2018 61.5	26/02/2018 96.5	27/02/2018 100.5	27/02/2018 101.0	809.0
Narara	19/06/2018 9.0	19/06/2018 10.5	19/06/2018 14.0	19/06/2018 17.0	19/06/2018 24.5	20/02/2018 32.0	25/02/2018 46.0	26/02/2018 67.0	26/02/2018 96.5	27/02/2018 101.0	27/02/2018 101.0	787.5
Mount Elliot	2/04/2018 8.0	2/04/2018 14.5	2/04/2018 23.0	2/04/2018 29.5	2/04/2018 38.5	2/04/2018 47.5	2/04/2018 50.5	26/02/2018 63.0	26/02/2018 91.0	27/02/2018 95.5	27/02/2018 96.0	829.0
Wyoming	2/04/2018 8.0	2/04/2018 14.0	2/04/2018 25.0	2/04/2018 33.5	2/04/2018 43.0	2/04/2018 55.0	2/04/2018 56.5	26/02/2018 76.0	26/02/2018 109.0	27/02/2018 113.5	27/02/2018 114.0	889.5
Kincumber	6/11/2018 8.5	6/11/2018 11.5	19/06/2018 15.5	19/06/2018 18.5	19/06/2018 22.0	19/06/2018 30.0	19/06/2018 48.0	19/06/2018 76.5	20/06/2018 90.5	20/06/2018 94.0	21/06/2018 96.5	761.0
Webbs Creek ¹	2/04/2018 8.2	2/04/2018 11.2	2/04/2018 11.8	24/03/2018 14.6	24/03/2018 16.2	25/02/2018 20.2	25/02/2018 36.2	26/02/2018 55.0	26/02/2018 72.0	27/02/2018 74.0	27/02/2018 74.2	359.2

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Colo Junction	26/10/2017 5.2	26/10/2017 10.0	26/10/2017 17.8	26/10/2017 20.2	26/10/2017 23.2	27/10/2017 27.8	25/02/2018 31.8	26/02/2018 43.8	26/02/2018 60.8	27/02/2018 62.8	27/02/2018 63.4	429.4
Sackville Downstream ¹	26/10/2017 3.2	26/10/2017 6.2	26/10/2017 8.8	26/10/2017 11.8	26/10/2017 14.2	27/10/2017 18.4	25/02/2018 23.0	26/02/2018 34.2	26/02/2018 49.6	27/02/2018 50.0	27/02/2018 50.0	321.8
Curl Curl	9/01/2018 11.5	9/01/2018 20.0	9/01/2018 23.5	9/01/2018 25.5	9/01/2018 26.5	13/03/2018 51.5	13/03/2018 59.5	26/02/2018 66.5	26/02/2018 77.5	26/02/2018 77.5	7/06/2018 80.5	686.5
Kelso Creek	7/11/2017 9.0	7/11/2017 17.0	7/11/2017 20.5	7/11/2017 20.5	7/11/2017 20.5	7/11/2017 20.5	25/02/2018 24.5	26/02/2018 31.5	26/02/2018 39.0	26/02/2018 44.0	26/02/2018 44.0	363.0
Rixons Pass	27/02/2018 7.5	27/02/2018 13.0	26/02/2018 15.0	18/11/2018 15.0	18/11/2018 17.0	17/11/2017 32.5	29/04/2018 37.0	6/11/2017 43.0	6/11/2017 53.0	6/11/2017 62.0	6/11/2017 62.0	653.5
Russell Vale	2/12/2017 6.5	6/11/2017 9.5	31/12/2017 14.0	31/12/2017 16.0	31/12/2017 23.0	31/12/2017 37.5	31/12/2017 44.5	31/12/2017 45.5	26/02/2018 51.5	27/02/2018 57.5	27/02/2018 58.5	614.0
Mount Pleasant	17/11/2017 9.5	17/11/2017 16.0	17/11/2017 25.0	17/11/2017 34.5	17/11/2017 59.5	17/11/2017 89.5	18/11/2017 107.0	18/11/2017 112.0	18/11/2017 121.0	18/11/2017 122.0	18/11/2017 121.5	794.0
Mount Kembla	28/05/2018 11.0	28/05/2018 16.0	17/11/2017 24.0	17/11/2017 33.5	17/11/2017 55.0	17/11/2017 89.0	18/11/2017 105.0	18/11/2017 112.5	18/11/2017 124.0	18/11/2017 125.0	18/11/2017 125.5	669.0
Dombarton Loop ¹	17/11/2017 8.5	17/11/2017 16.0	17/11/2017 22.0	17/11/2017 32.0	17/11/2017 61.0	17/11/2017 100.5	17/11/2017 123.5	18/11/2017 130.5	18/11/2017 144.0	18/11/2017 146.5	18/11/2017 146.0	754.5
Wongawilli	17/11/2017 10.5	17/11/2017 19.0	17/11/2017 32.5	17/11/2017 45.0	17/11/2017 62.0	17/11/2017 84.5	17/11/2017 97.5	18/11/2017 104.5	18/11/2017 115.0	18/11/2017 116.0	18/11/2017 116.0	561.5
Port Kembla	6/11/2017 6.5	6/11/2017 11.5	6/11/2017 12.5	6/11/2017 14.0	6/11/2017 16.5	6/11/2017 21.5	28/06/2018 28.0	25/02/2018 41.5	26/02/2018 52.0	27/02/2018 56.0	27/02/2018 56.0	530.5
Darkes Road	17/11/2017 8.0	17/11/2017 15.0	17/11/2017 27.0	17/11/2017 37.0	17/11/2017 53.5	17/11/2017 89.5	17/11/2017 103.5	18/11/2017 117.0	18/11/2017 131.0	18/11/2017 132.0	18/11/2017 132.0	601.0
Cleveland Road	29/04/2018 10.0	29/04/2018 16.5	17/11/2017 21.0	17/11/2017 29.5	17/11/2017 50.5	17/11/2017 90.5	17/11/2017 102.5	18/11/2017 115.0	18/11/2017 134.5	18/11/2017 135.5	18/11/2017 135.5	587.0
Huntley Colliery	26/10/2017 10.5	26/10/2017 19.0	26/10/2017 29.5	26/10/2017 33.0	17/11/2017 45.5	17/11/2017 85.5	17/11/2017 108.5	18/11/2017 121.5	18/11/2017 140.0	18/11/2017 141.5	18/11/2017 142.0	674.5
Upper Calderwood	17/11/2017 8.5	19/02/2018 13.5	17/11/2017 22.0	26/10/2017 27.5	26/10/2017 38.0	17/11/2017 66.5	17/11/2017 86.0	18/11/2017 97.5	18/11/2017 134.5	18/11/2017 135.0	18/11/2017 135.5	648.0
Little Lake Entrance	17/11/2017 7.5	17/11/2017 12.5	17/11/2017 17.0	17/11/2017 19.0	17/11/2017 36.0	17/11/2017 50.5	17/11/2017 55.5	18/11/2017 67.5	18/11/2017 84.0	18/11/2017 84.5	18/11/2017 84.0	565.5
North Macquarie	17/11/2017 11.5	17/11/2017 19.0	17/11/2017 25.5	17/11/2017 30.0	17/11/2017 41.0	17/11/2017 64.0	17/11/2017 81.0	18/11/2017 92.0	18/11/2017 118.5	18/11/2017 120.0	18/11/2017 120.0	684.0

Station	Duration											Total yearly rainfall
	5 min	10 min	20 min	30 min	60 min	3 hrs	6 hrs	12 hrs	24 hrs	48 hrs	72 hrs	
Clover Hill	12/01/2018 9.0	12/01/2018 15.5	17/11/2017 19.0	17/11/2017 22.5	17/11/2017 28.0	17/11/2017 58.0	17/11/2017 74.0	18/11/2017 86.0	18/11/2017 117.0	18/11/2017 118.5	19/11/2017 119.0	724.5
Nurrewin	17/11/2017 9.0	17/11/2017 14.5	18/11/2017 20.0	18/11/2017 21.5	18/11/2017 27.0	18/11/2017 41.5	18/11/2017 47.5	18/11/2017 59.5	18/11/2017 99.0	18/11/2017 100.0	18/11/2017 100.0	585.5
Yellow Rock Road	6/06/2018 8.5	12/01/2018 12.5	19/02/2018 18.5	19/02/2018 22.5	19/02/2018 27.5	19/02/2018 30.0	25/02/2018 44.5	25/02/2018 59.0	26/02/2018 74.5	26/02/2018 86.5	27/02/2018 89.5	679.0
Lake Conjola Downstream	26/10/2017 7.0	26/10/2017 12.0	26/10/2017 20.5	26/10/2017 29.0	26/10/2017 38.0	6/11/2017 46.0	6/11/2017 59.5	6/11/2017 64.0	26/02/2018 76.5	26/02/2018 94.5	26/02/2018 94.5	681.5
Barlows Bay	6/11/2017 7.5	6/11/2017 13.5	6/11/2017 21.0	6/11/2017 30.0	6/11/2017 51.5	26/10/2017 85.0	26/10/2017 91.0	6/11/2017 110.0	6/11/2017 116.5	6/11/2017 117.0	6/11/2017 117.5	878.5
Regatta Point¹	26/10/2017 5.5	26/10/2017 9.0	26/10/2017 15.0	6/11/2017 18.0	6/11/2017 34.0	6/11/2017 58.0	6/11/2017 75.5	6/11/2017 93.5	6/11/2017 98.0	6/11/2017 98.0	6/11/2017 98.0	716.0

¹ Some measure of data loss occurred at these stations. See individual plots for further details.
Note – the date listed refers to the time that the recorded total rainfall ends.

4.1 Southern Oscillation Index

The Southern Oscillation Index (SOI) is a calculation of monthly or seasonal shifts in the air pressure between Darwin and Tahiti (source: Bureau of Meteorology). As well as being linked to the temperature of the Pacific Ocean and the strength of Pacific trade winds, the SOI is also associated with rainfall and can be used to predict whether higher or lower than average rainfall may occur in northern and eastern Australia.

A La Niña episode occurs when there are ongoing positive SOI values, and increases the probability of higher than average rainfall in northern and eastern Australia. Sustained negative SOI values have been coined El Niño events, and are associated with a reduction in rainfall over northern and eastern Australia. Even low to moderate El Niño events can lead to severe droughts in Australia. The SOI for the period July 1998 to June 2018 is graphically represented in [Figure 3](#).

4.2 Data provision

Rainfall data is provided to the public on behalf of OEH via the following methods:

- MHL's public internet home pages, providing near real time access to a limited sample of data/email correspondence and File Transfer Protocol (FTP)
- MHL provides OEH and NSW State Emergency Service officers access to near real time environmental data and our 'quality assured' historical database through the OEH information portal, which is password protected
- NSW SES officers also receive automated notifications from flood warning systems in NSW
- a web-based data request system is available where electronic requests can be submitted via MHL's homepage at <http://www.mhl.nsw.gov.au> under the data request menu.

During 2017-2018:

- MHL received in excess of 92,000 visitors per month to its website
- MHL served in excess of 180,000 webpage hits per month to customers and to the public
- approximately 2,200,000 webpage hits were recorded from the public (excluding customers) in 2017–2018.

Data access also continues to assist the Bureau of Meteorology, local government authorities, State Emergency Service, NSW Police, WaterNSW, NSW Surf Life Saving Association, universities, the NSW court system, private consultancies, NSW Roads and Maritime Services and the Natural Resources Commission.

4.3 Data capture performance

Rainfall data presented by MHL is collected, analysed and subjected to a strict quality assurance process in accordance with MHL’s internal standards and work instructions. This process results in a quality code which is assigned to all rainfall data, as described in [Table 4.4](#) below.

During 2017–2018, the overall data capture across the network, for data with a quality code of 105 or better, was 99.0%. [Table 5.1 Index of figures](#) provides data capture percentages for each rainfall region. Missing or 208 quality coded data can result in gaps in the data record. This can be caused by a range of reasons, such as equipment damage or failure, power failure, or site specific environmental issues.

Automatic recorded rainfall data is recorded to a resolution equal to the size of the tipping bucket (0.2 mm, 0.5 mm or 1.0 mm). Each record or tip of the bucket is triggered when the tipping bucket is filled, which may occur over a period of time. These uncertainties are accounted for through MHL’s quality control and quality assurance processes.

Table 4.4 MHL data quality code descriptions

Quality code		Rainfall*
5	Records processed to	±3% of calibration
55	Records processed to	±5% of calibration
100	Data from previous MHL database, processed to	±3% of calibration
105	Records processed to	±10% of calibration
208	Records processed to greater than	<-10% or >10% of calibration
150	Uncoded – data not yet quality controlled	Raw data from the instrument with only preliminary quality checks performed
1, 204, 205, 206, 207, 255	Data loss/data missing	

* A quality code is assigned based on infield status verification checks.

5. Rainfall monitoring summary

This section documents locality maps and quality assured rainfall monitoring summaries for each station. [Table 5.1](#) and [Table 5.2](#) provide indexes to the figures presented. The rainfall plots shown in Figure 5 to Figure 92 are presented as daily rainfall totals from midnight to midnight.

Table 5.1 Index of figures

	Figure
Typical pluviometer station	1
Data transfer schematic	2
Southern Oscillation Index, June 1998–June 2018	3

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Tweed River and Brunswick River Regions					100.0%	4
Tweed	Cudgera	558046	56	549668	6859164		5
Brunswick	Main Arm	558053	56	542469	6847276		6
Brunswick	Huonbrook	558049	56	537723	6841573		7
Brunswick	Myocum	558036	56	550528	6837390		8
Station Locality Map	Richmond River Region					100.0%	9
Richmond	Lake Ainsworth	203455	56	557863	6816160		10
Station Locality Map	Bellinger River Region (North)					100.0%	11
Bellinger	Wooli Caravan Park	205463	56	524551	6697797		12
Station Locality Map	Bellinger River Region (South)					100.0%	13
Bellinger	Perry Drive	559019	56	510142	6650416		14
Bellinger	Shephards Lane	559017	56	508196	6650884		15
Bellinger	Red Hill	559016	56	506635	6649672		16
Bellinger	Newports Creek	559051	56	505893	6646680		17
Bellinger	Middle Boambee	559048	56	504720	6645291		18
Bellinger	North Bonville	559050	56	500593	6641143		19
Bellinger	Kooroowi	205440	56	482967	6629647		20
Station Locality Map	Nambucca River Region					100.0%	21
Nambucca	Stuarts Island Downstream	205466	56	499519	6608564		22
Nambucca	Utungun	205414	56	485800	6600344		23
Station Locality Map	Macleay River and Hastings River Regions					100.0%	24
Macleay	Aldavilla Downstream	206459	56	479318	6561231		25
Hastings	Green Valley	207406	56	486416	6540068		26
Hastings	Telegraph Point	207415	56	481082	6534512		27

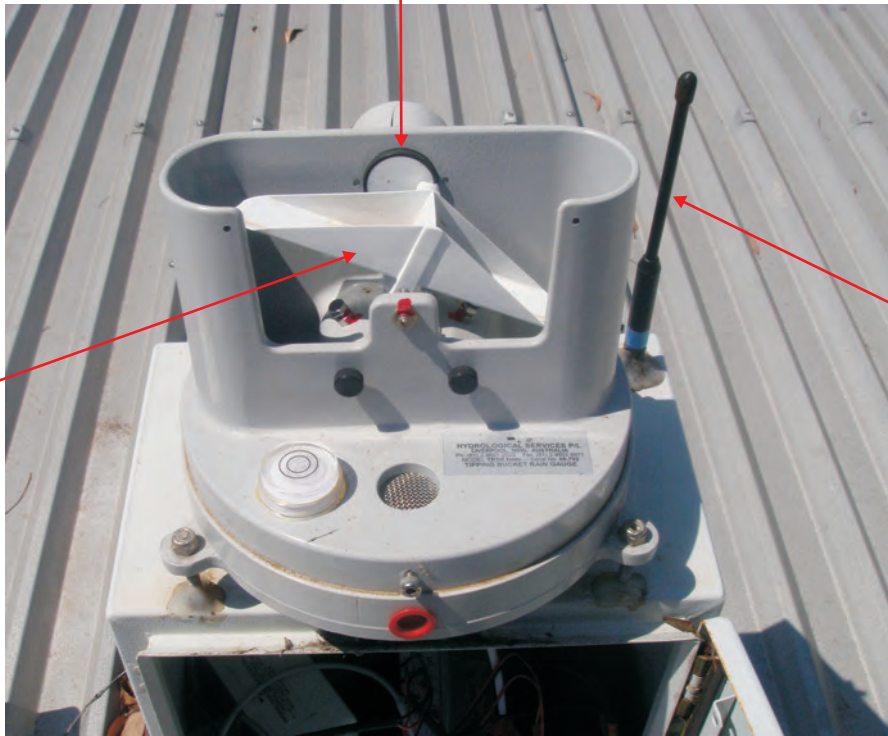
Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Camden Haven Region					97.9%	28
Camden Haven	Logans Crossing	207428	56	470913	6502295		29
Manning	Mount George	208440	56	419229	6472262		30
Station Locality Map	Karuah River Region					93.2%	31
Karuah	Nabiac	209404	56	436831	6446432		32
Karuah	Tuncurry Downstream	209401D	56	450368	6441819		33
Karuah	Pacific Palms Wharf	209406	56	455401	6422551		34
Karuah	Tarback Bay	209465	56	451548	6417906		35
Karuah	Bulahdelah	209460	56	425442	6413407		36
Station Locality Map	Hunter River Region					99.9%	37
Hunter	Gostwyck	210402	56	369088	6396074		38
Hunter	Seaham	210462	56	381105	6385316		39
Hunter	Belmore Bridge	210458	56	364492	6377780		40
Hunter	Hexham Bridge	210448	56	376568	6368156		41
Station Locality Map	Macquarie-Tuggerah Lakes (North) Region					100.0%	42
Macquarie-Tuggerah Lakes	Barnsley	561067	56	367906	6355834		43
Macquarie-Tuggerah Lakes	Martinsville	561083	56	351239	6341583		44
Macquarie-Tuggerah Lakes	Mandalong	561081	56	355224	6335165		45
Macquarie-Tuggerah Lakes	Wyee	561097	56	358608	6328268		46
Station Locality Map	Macquarie-Tuggerah Lakes (South), Brisbane Water Regions					100.0%	47
Macquarie-Tuggerah Lakes	Whitemans Ridge	561026	56	343653	6324899		48
Macquarie-Tuggerah Lakes	Yarramalong	561137	56	338869	6322377		49
Macquarie-Tuggerah Lakes	Kulnura	561078	56	333796	6321517		50
Macquarie-Tuggerah Lakes	Toukley	211401	56	362599	6318531		51
Macquarie-Tuggerah Lakes	Hamlyn Terrace	561133	56	357399	6319854		52
Macquarie-Tuggerah Lakes	Mardi Dam	561082	56	351038	6314555		53
Macquarie-Tuggerah Lakes	Sterland	567138	56	342433	6315335		54
Macquarie-Tuggerah Lakes	Kangy Angy	561132	56	350168	6310609		55
Macquarie-Tuggerah Lakes	Berkeley Vale	561134	56	353191	6309376		56
Macquarie-Tuggerah Lakes	Bateau Bay	561069	56	358098	6305653		57
Macquarie-Tuggerah Lakes	Lisarow	561079	56	348900	6305317		58
Macquarie-Tuggerah Lakes	Strickland	561136	56	345377	6305541		59
Brisbane Water	Narara	561085	56	344310	6304220		60
Brisbane Water	Mount Elliot	561084	56	350646	6302980		61
Brisbane Water	Wyoming	561098	56	346415	6302026		62
Brisbane Water	Kincumber	561077	56	350387	6294461		63
Station Locality Map	Hawkesbury River Region					89.7%	64
Hawkesbury	Webbs Creek	212408	56	312331	6303939		65
Hawkesbury	Colo Junction	212407	56	303223	6298183		66
Hawkesbury	Sackville Downstream	212438	56	302769	6291566		67

Region	Station short name	Station no.	MGA	Easting	Northing	Capture %	Figure
Station Locality Map	Sydney Coastal Region					100.0%	68
Sydney Coastal	Curl Curl	213426	56	342094	6262459		69
Sydney Coastal	Kelso Creek	213430	56	313782	6241020		70
Station Locality Map	Wollongong Coastal Region					99.7%	71
Wollongong Coastal	Rixons Pass	568317	56	305281	6196889		72
Wollongong Coastal	Russell Vale	568318	56	306377	6196135		73
Wollongong Coastal	Mount Pleasant	568229	56	303026	6191630		74
Wollongong Coastal	Mount Kembla	568314	56	299550	6186441		75
Wollongong Coastal	Dombarton Loop	568307	56	294719	6185605		76
Wollongong Coastal	Wongawilli	568320	56	293261	6182388		77
Wollongong Coastal	Port Kembla	568316	56	306636	6182719		78
Wollongong Coastal	Darkes Road	568309	56	297450	6182477		79
Wollongong Coastal	Cleveland Road	568308	56	295800	6179726		80
Wollongong Coastal	Huntley Colliery	568311	56	290648	6178905		81
Wollongong Coastal	Upper Calderwood	568319	56	288750	6175160		82
Wollongong Coastal	Little Lake Entrance	214467	56	304250	6173571		83
Wollongong Coastal	Nurrewin	568228	56	284567	6173437		84
Wollongong Coastal	Clover Hill	568310	56	284233	6172392		85
Wollongong Coastal	North Macquarie	568315	56	291440	6171492		86
Wollongong Coastal	Yellow Rock Road	568321	56	292886	6167649		87
Station Locality Map	South Coast (North) Region					100.0%	88
South Coast	Lake Conjola Downstream	216420	56	272446	6094316		89
Station Locality Map	South Coast (Mid) Region					99.3%	90
South Coast	Barlows Bay	218415	56	239464	5988955		91
South Coast	Regatta Point	219405	56	236881	5971060		92

Table 5.2 Index of Appendix B figures

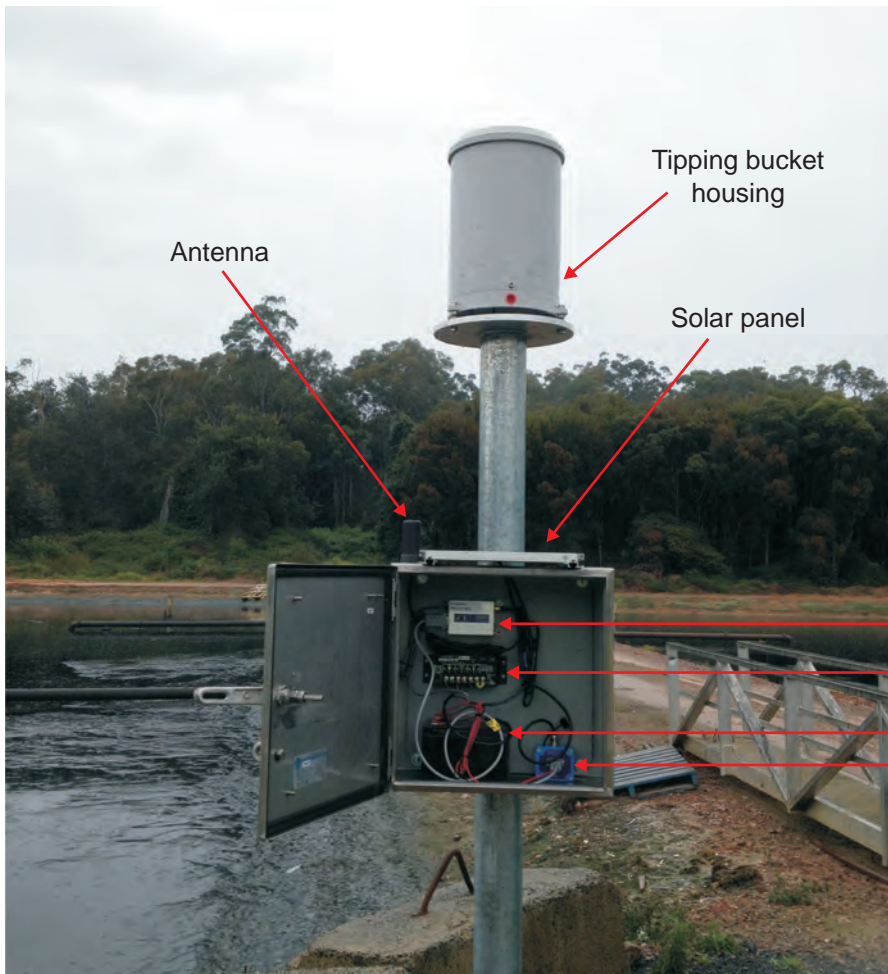
Sample rainfall data outputs	Figure
Sample daily and monthly rainfall plots	B1
Sample Intensity-Frequency-Duration formulated in 1987	B2
Sample Intensity-Frequency-Duration formulated in 2016	B3
Sample rain gauge tip times	B4

Reed switch registers bucket tips



Tipping bucket

Communication antenna



Antenna

Tipping bucket housing

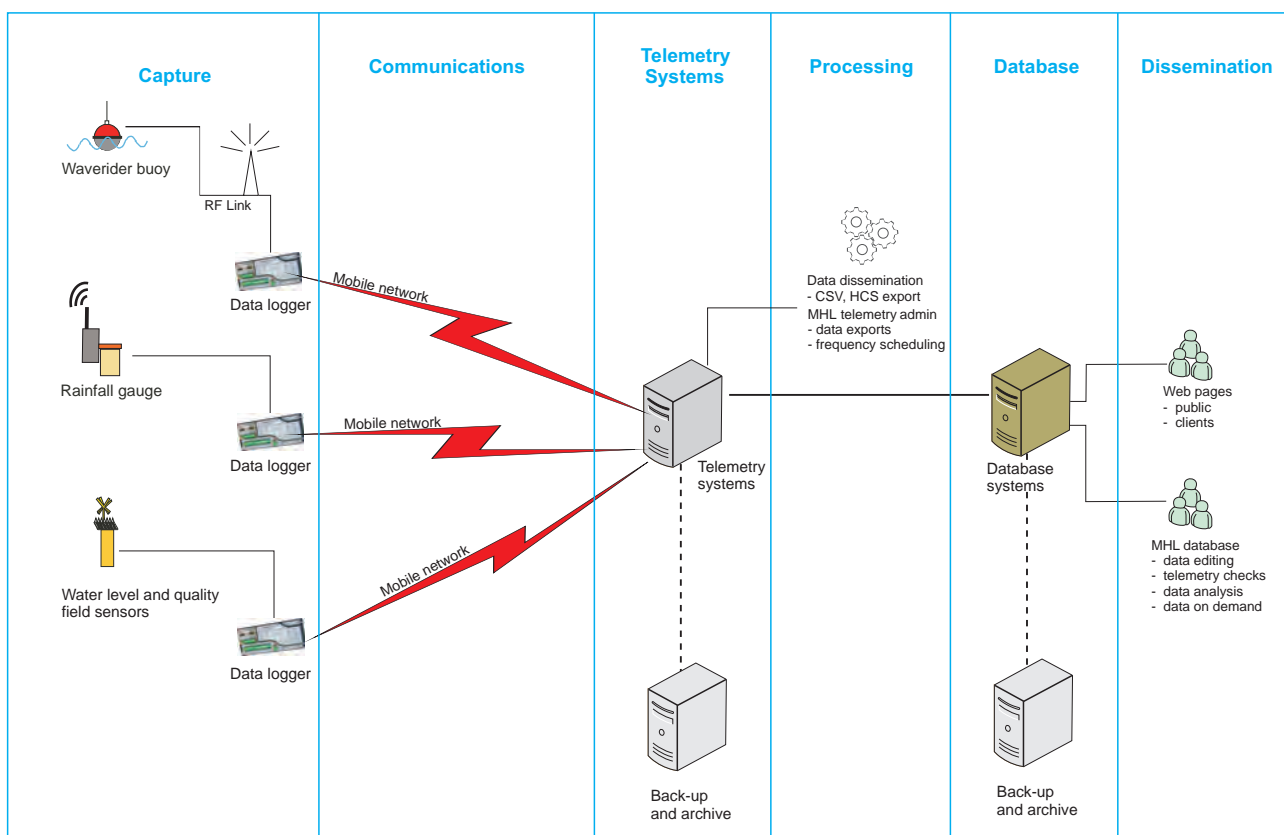
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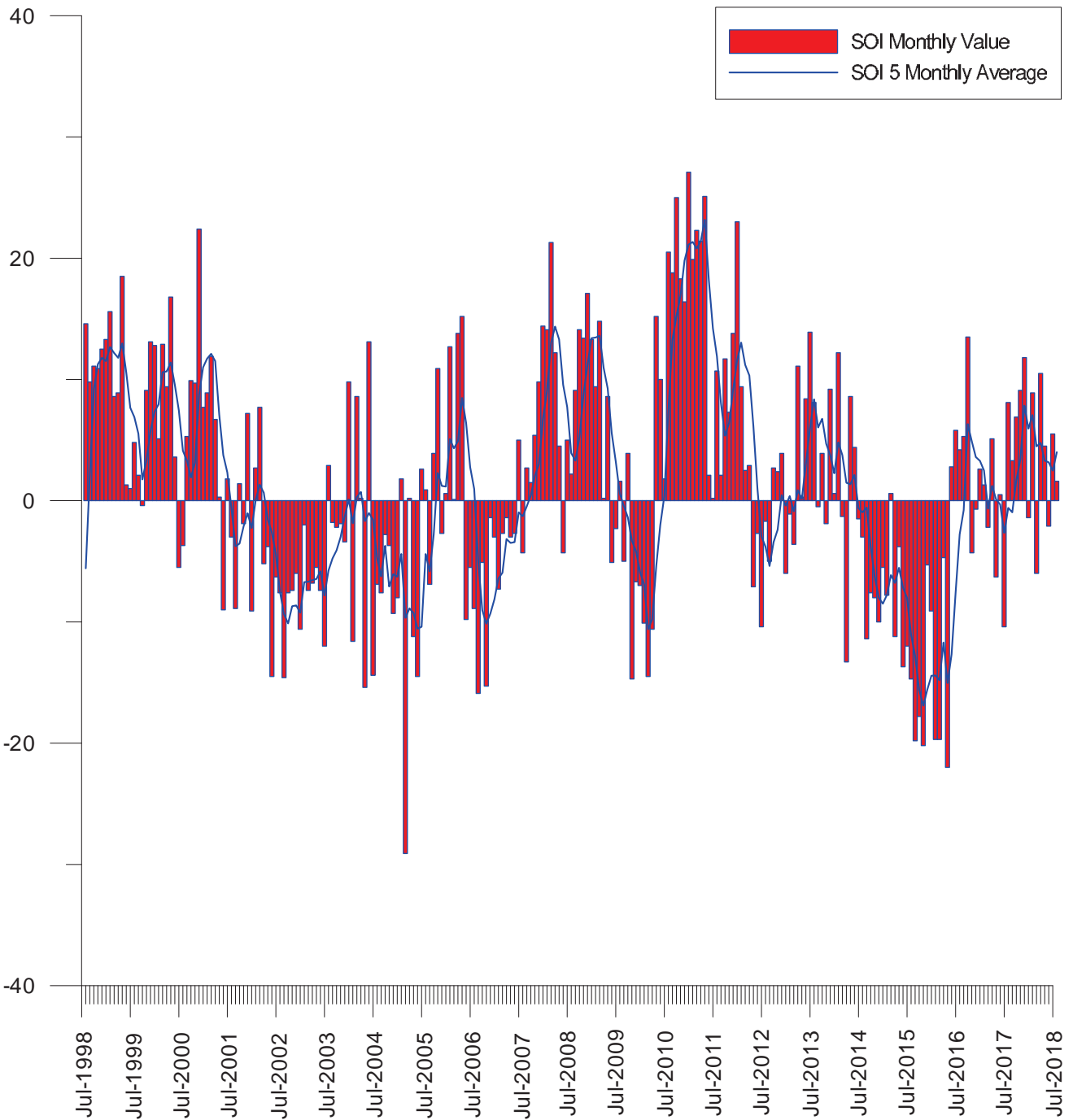
Modem

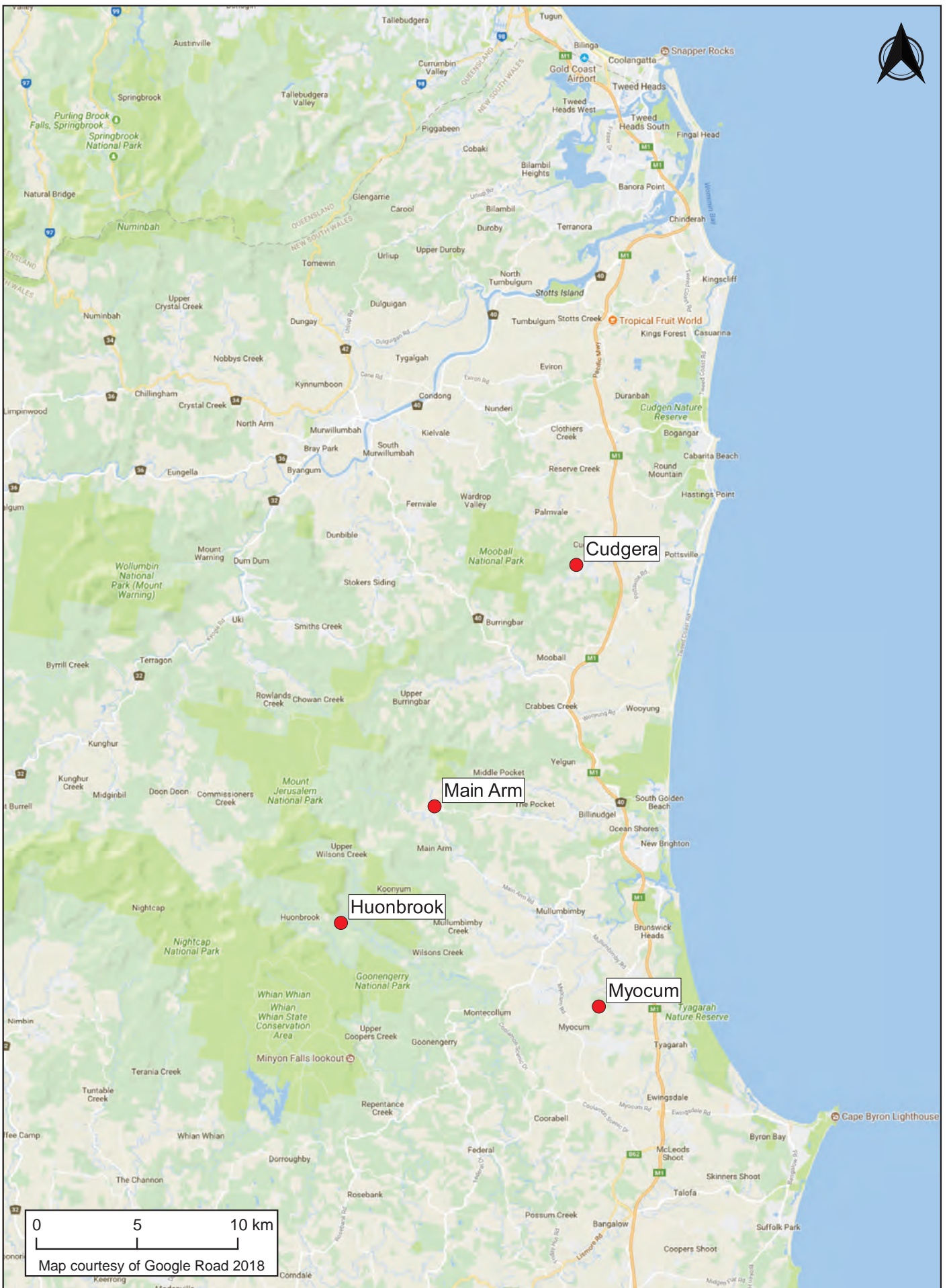
Solar regulator

Battery

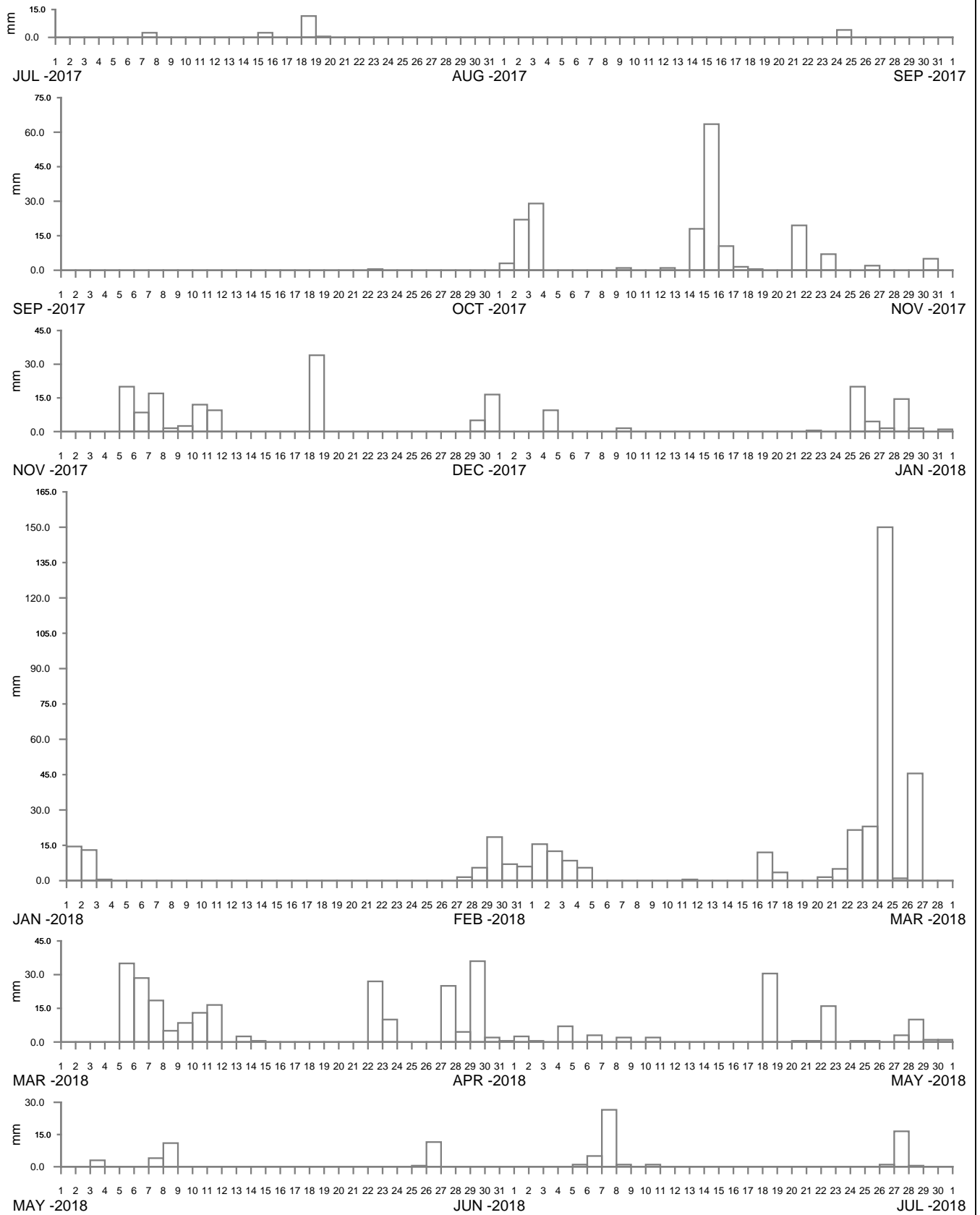
Logger

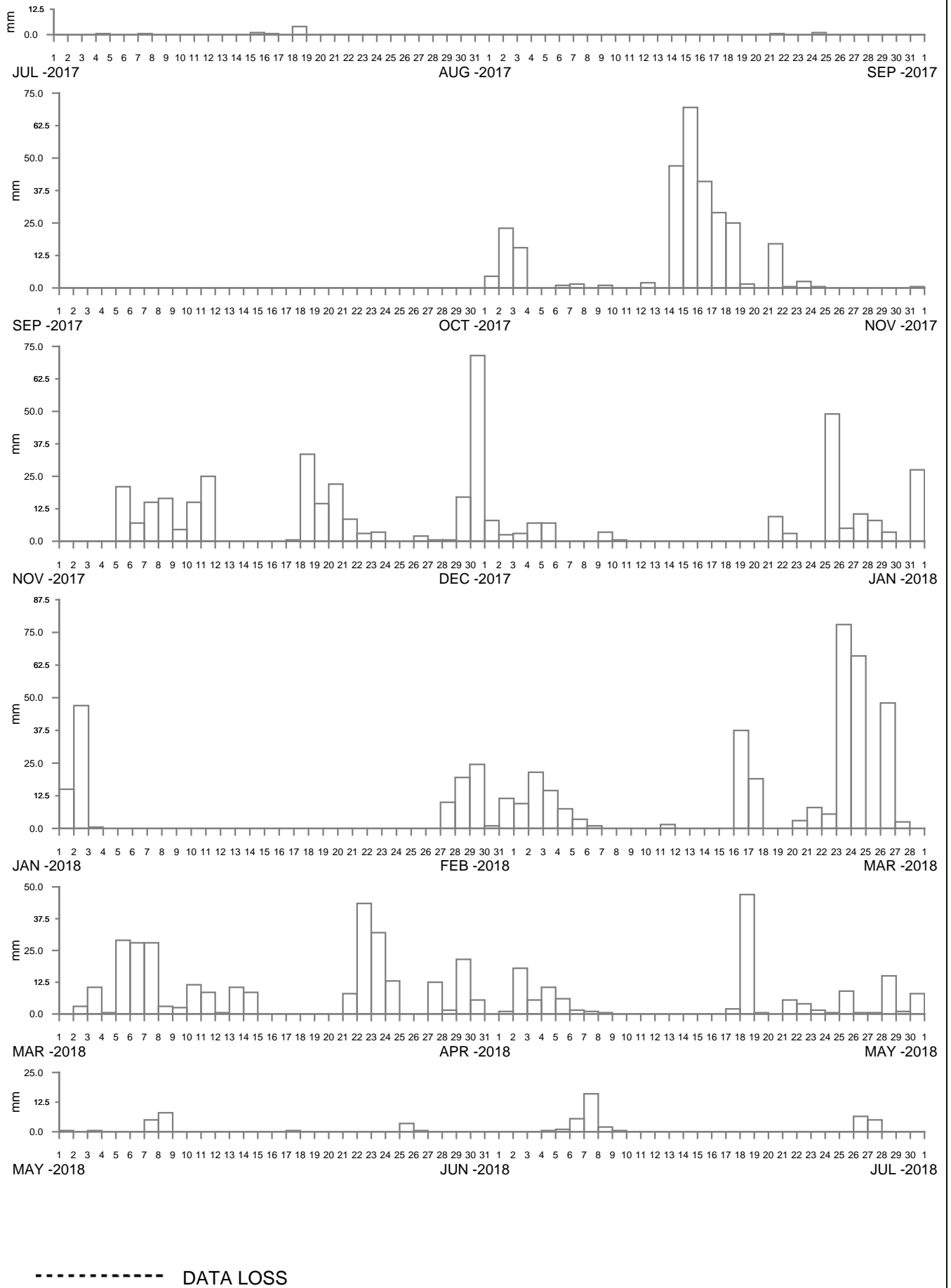


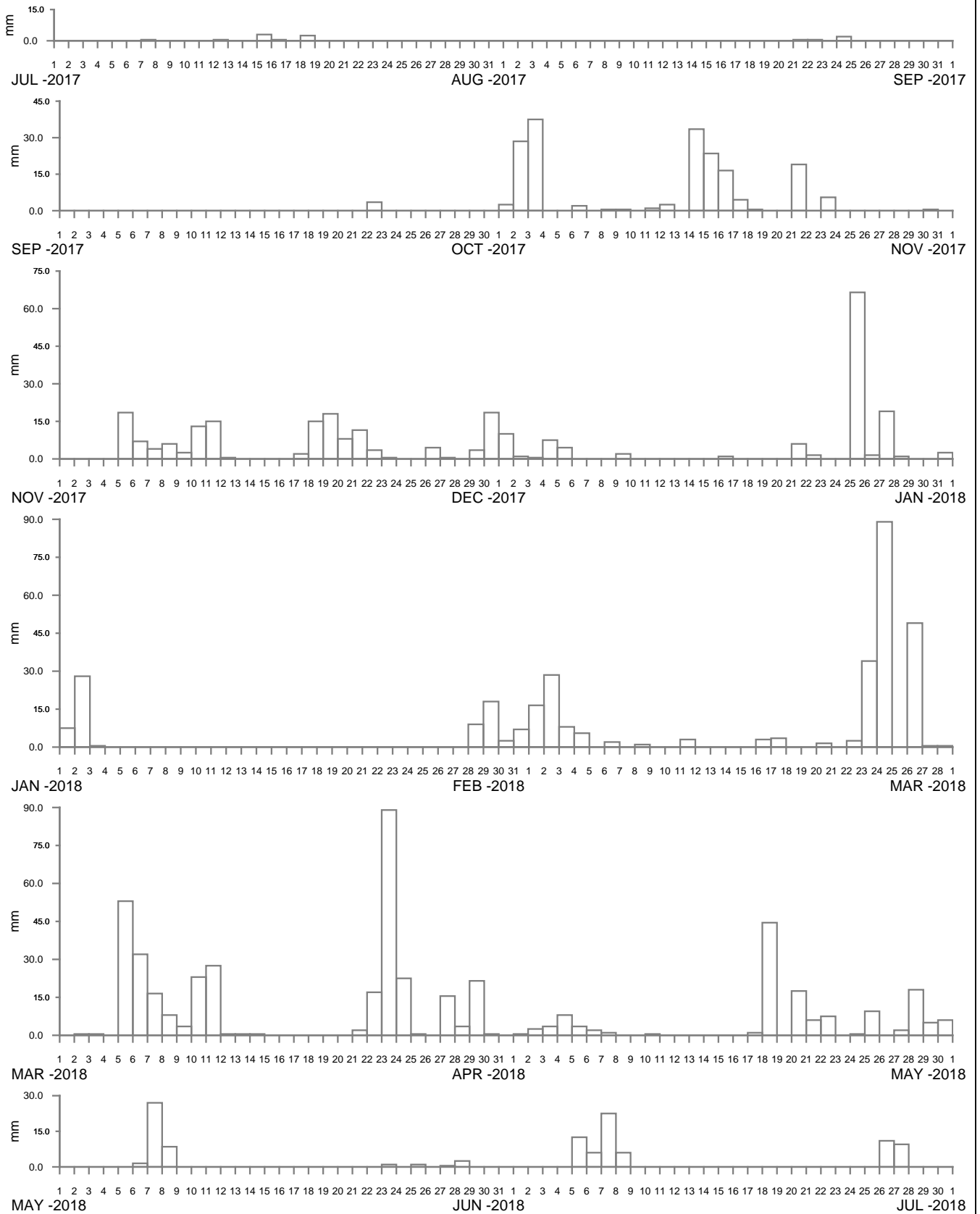


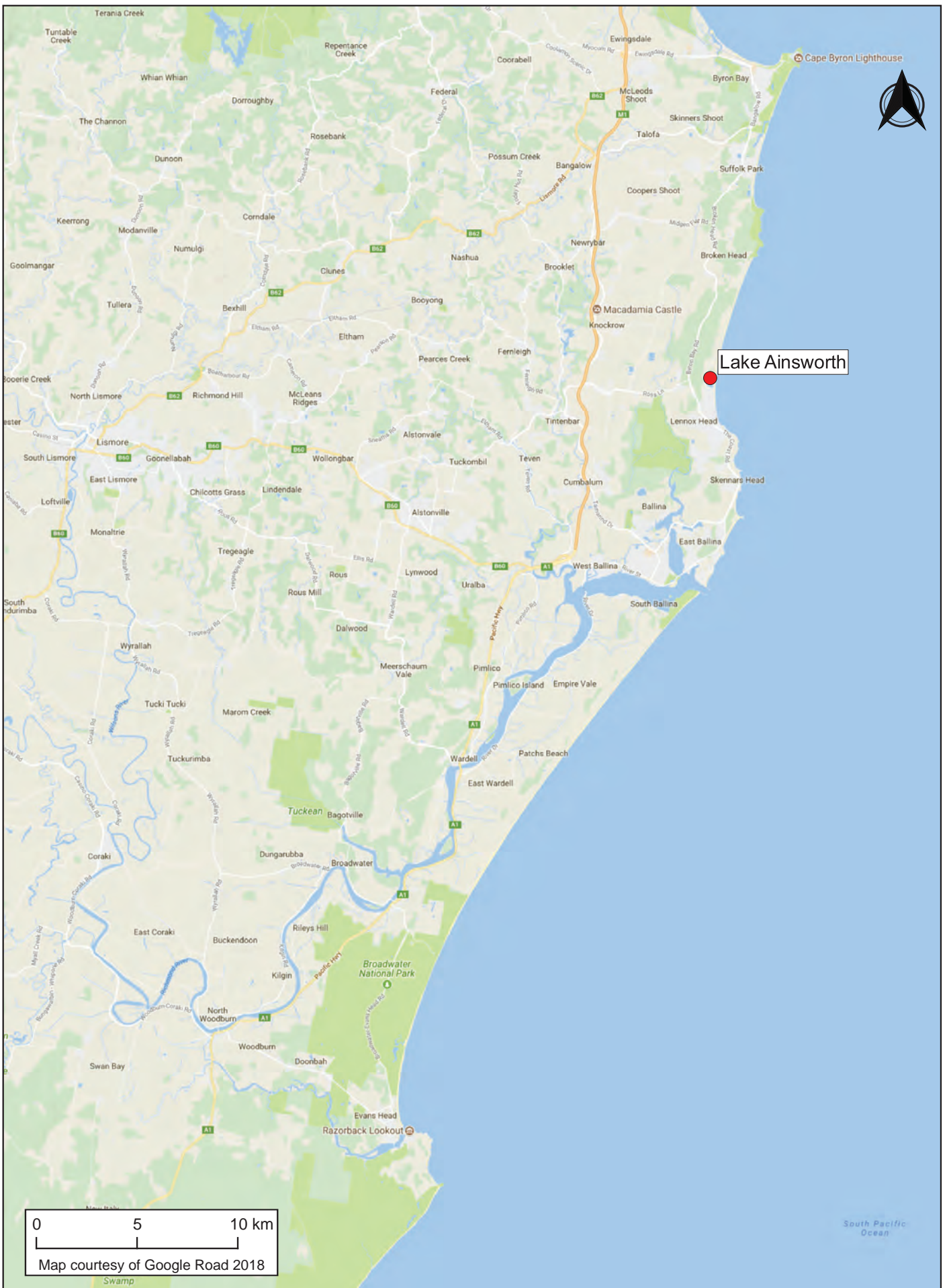


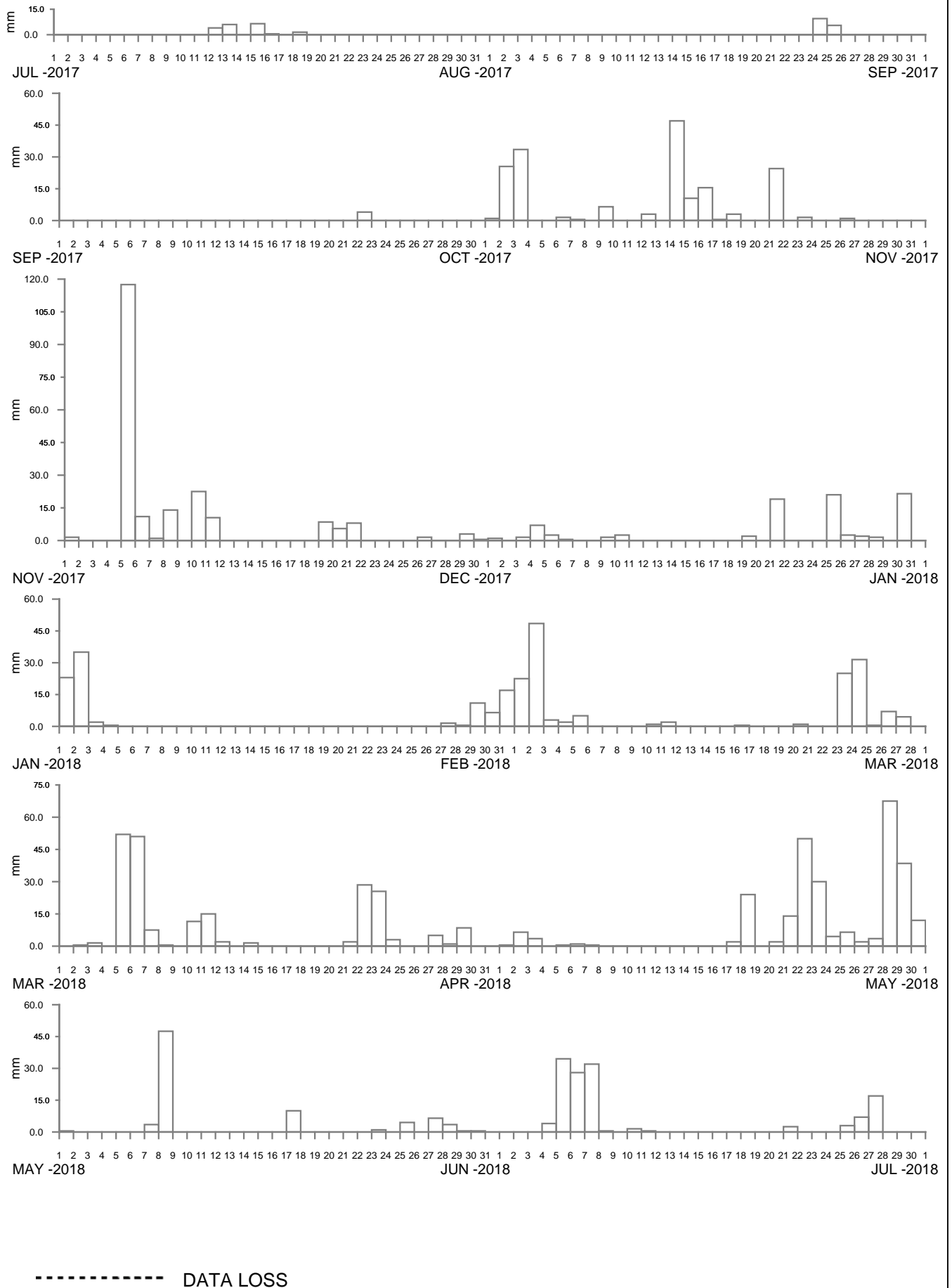
0 5 10 km
Map courtesy of Google Road 2018

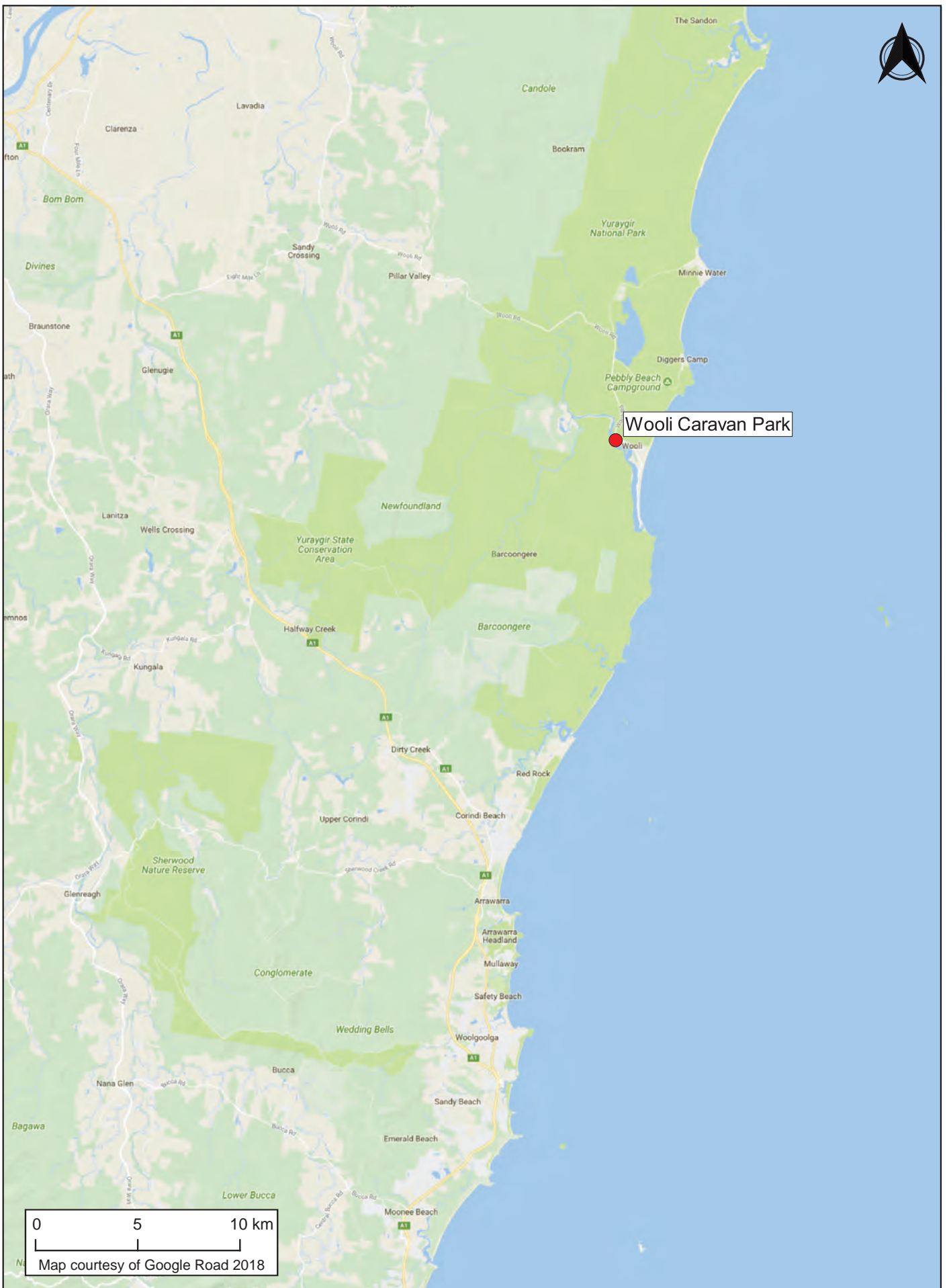






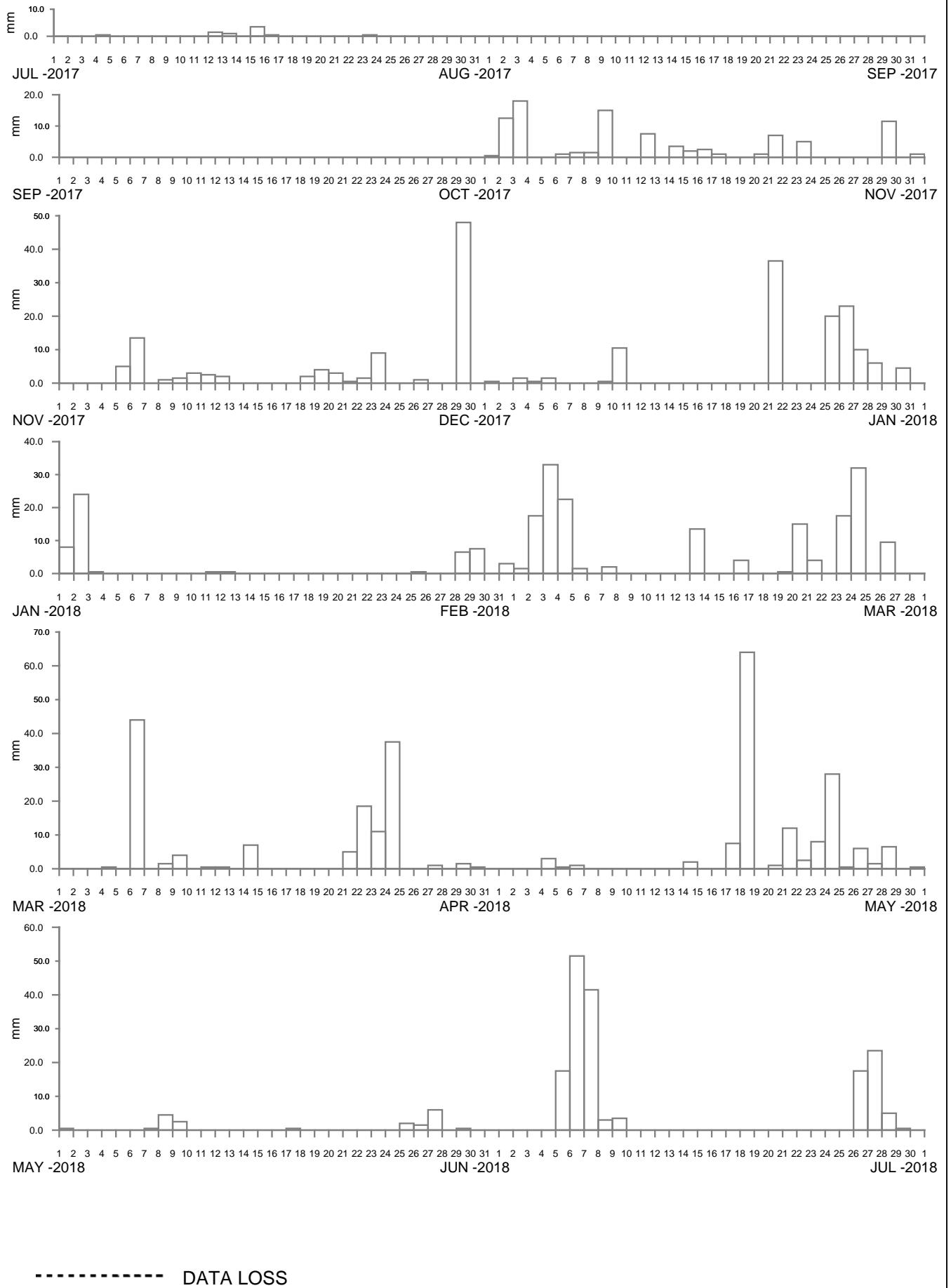


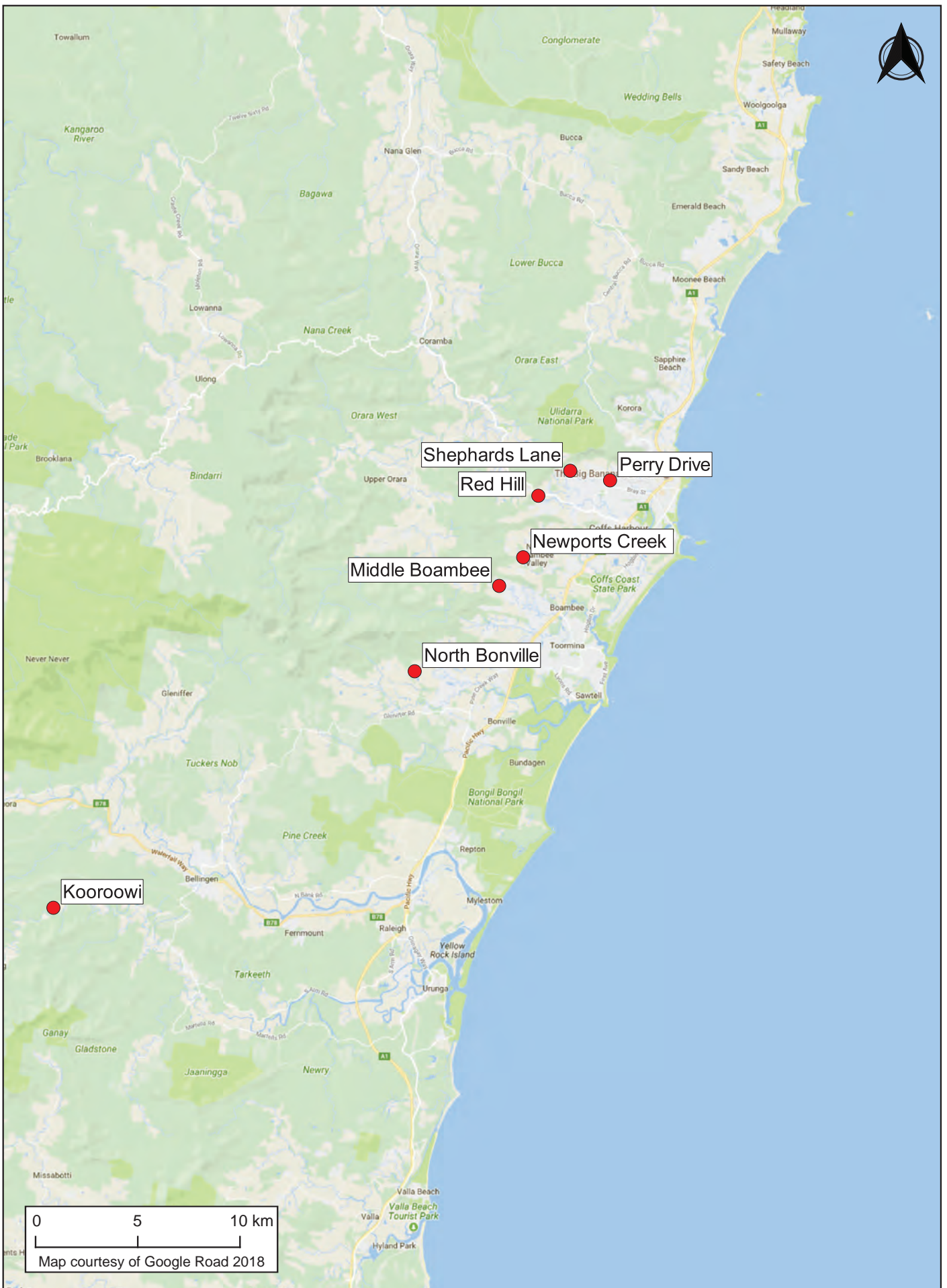




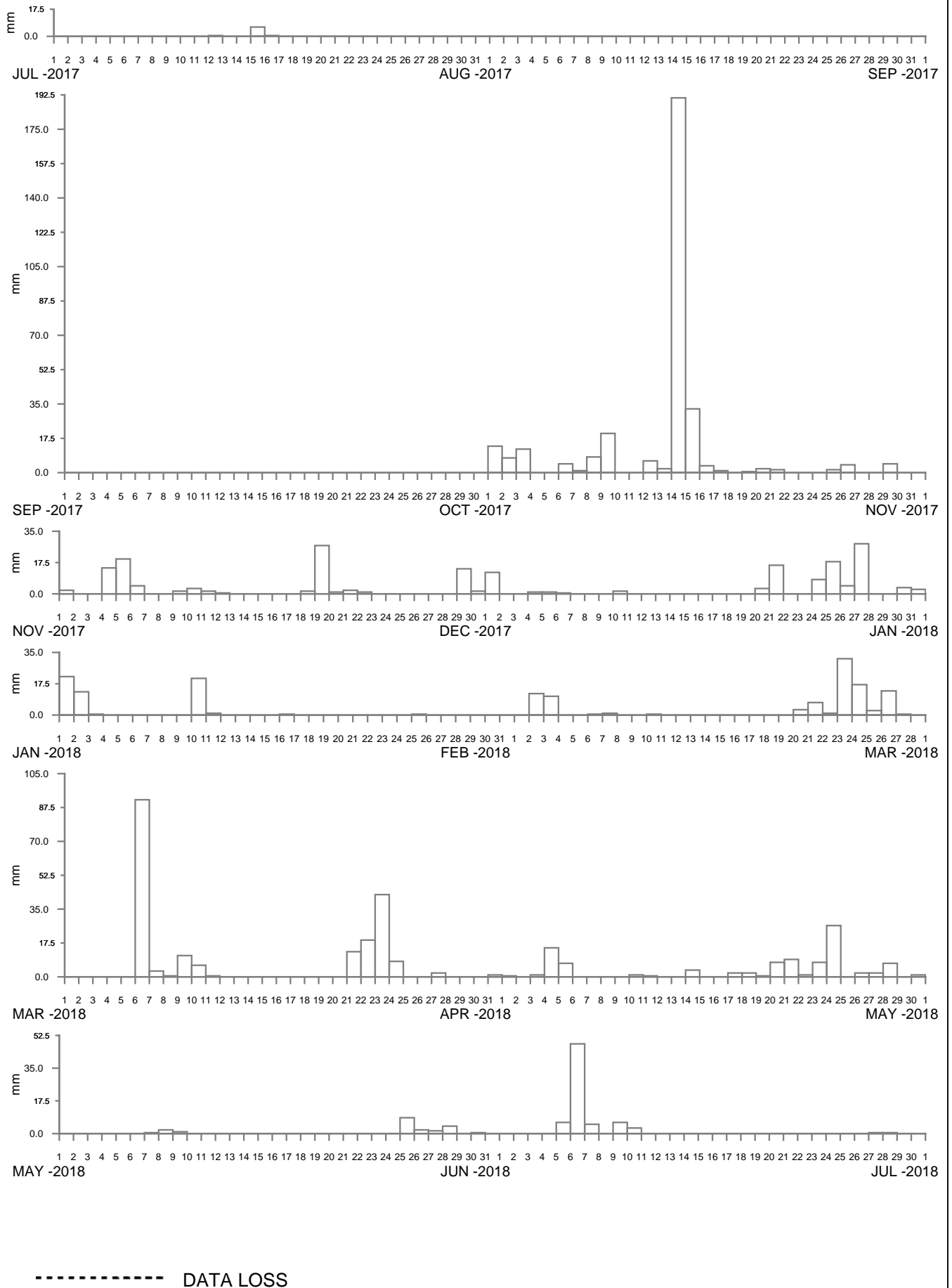
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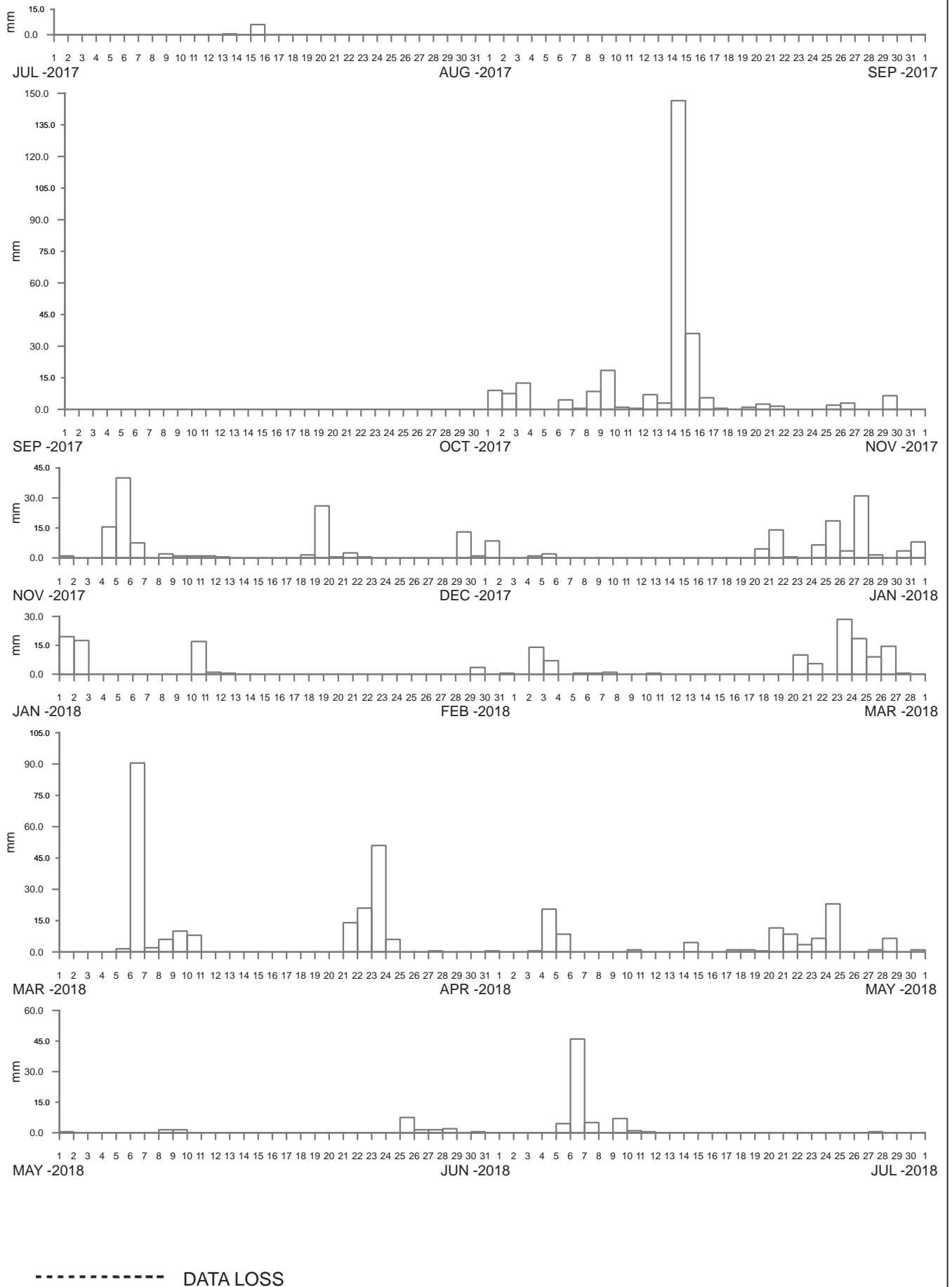
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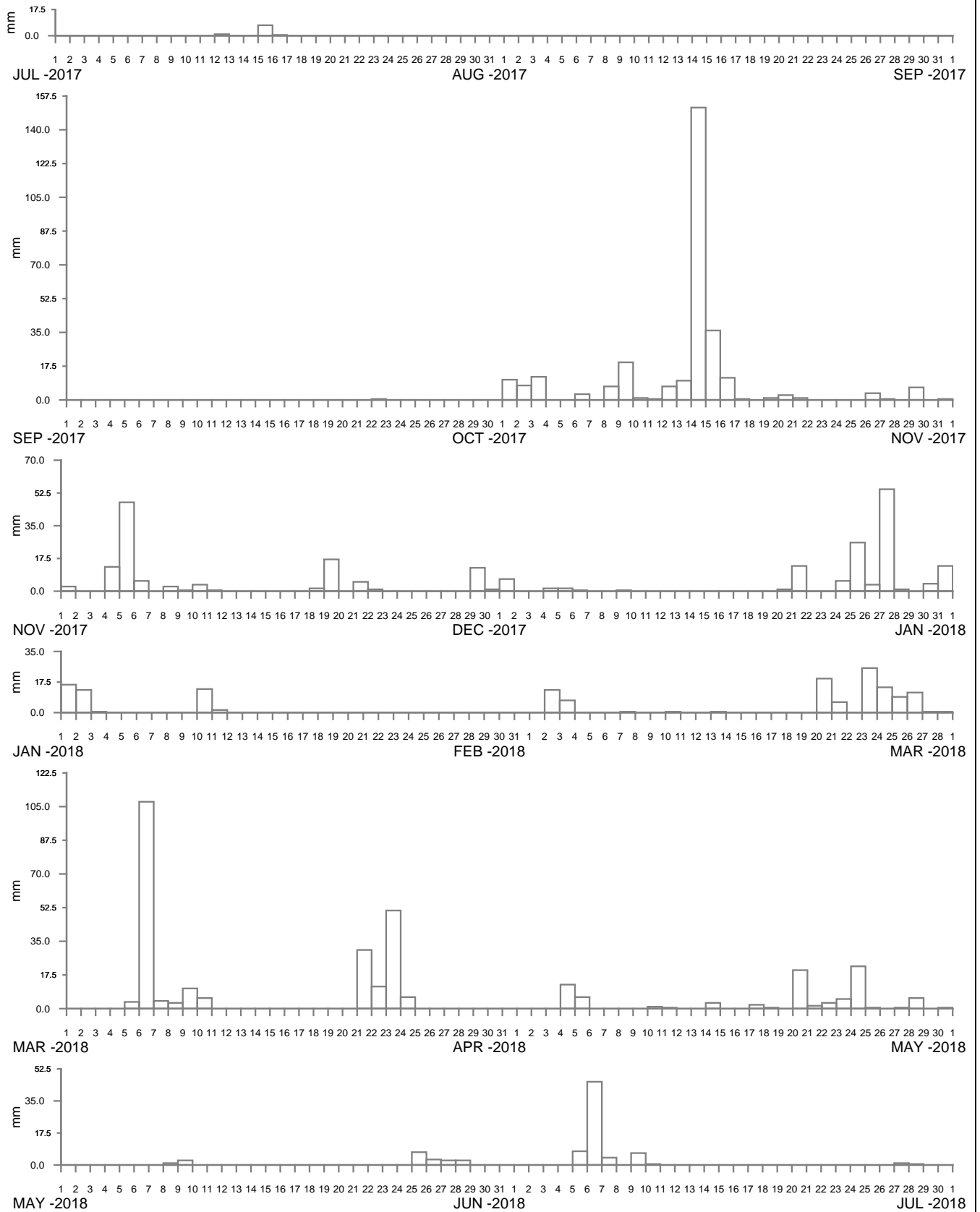




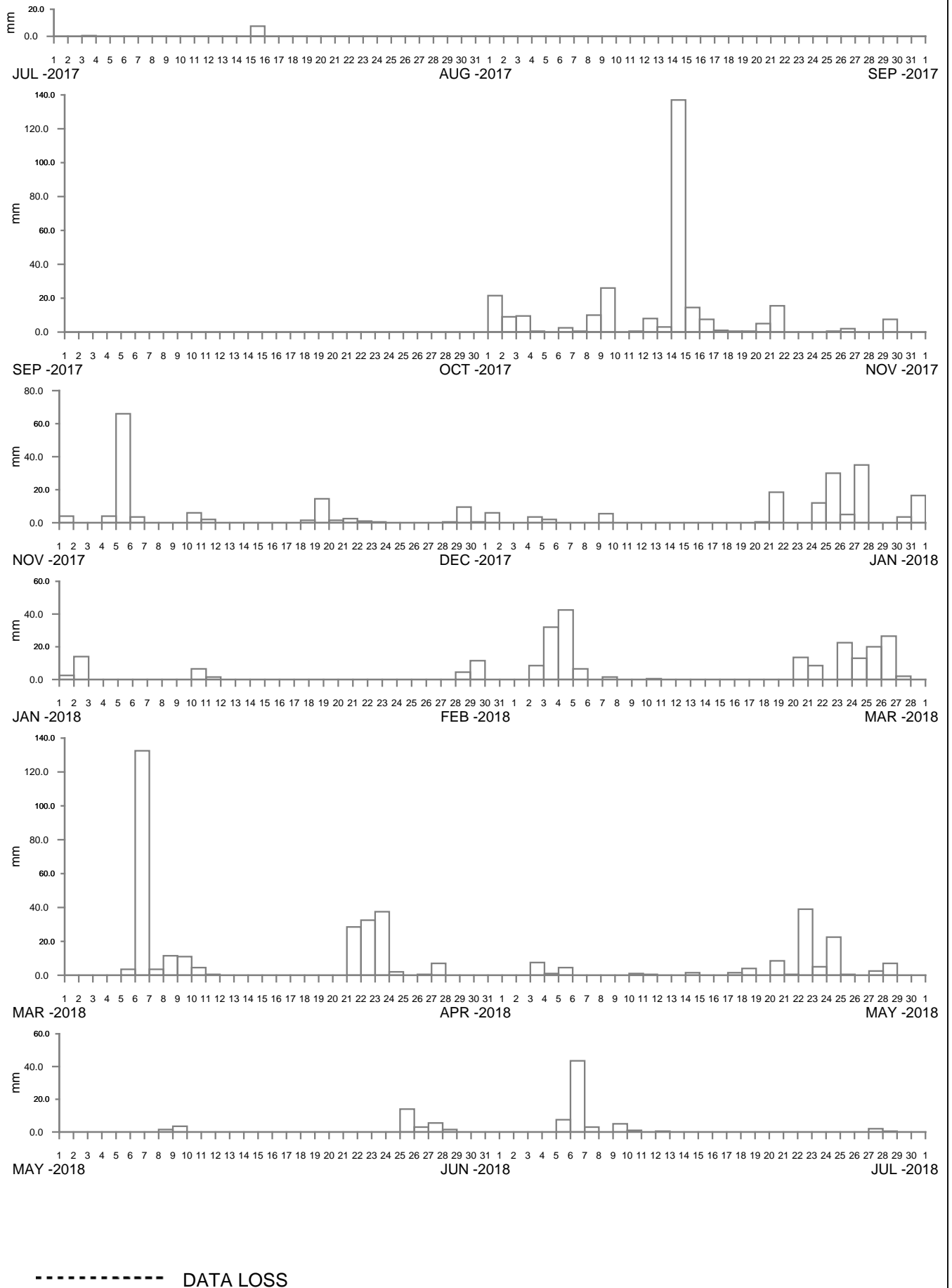
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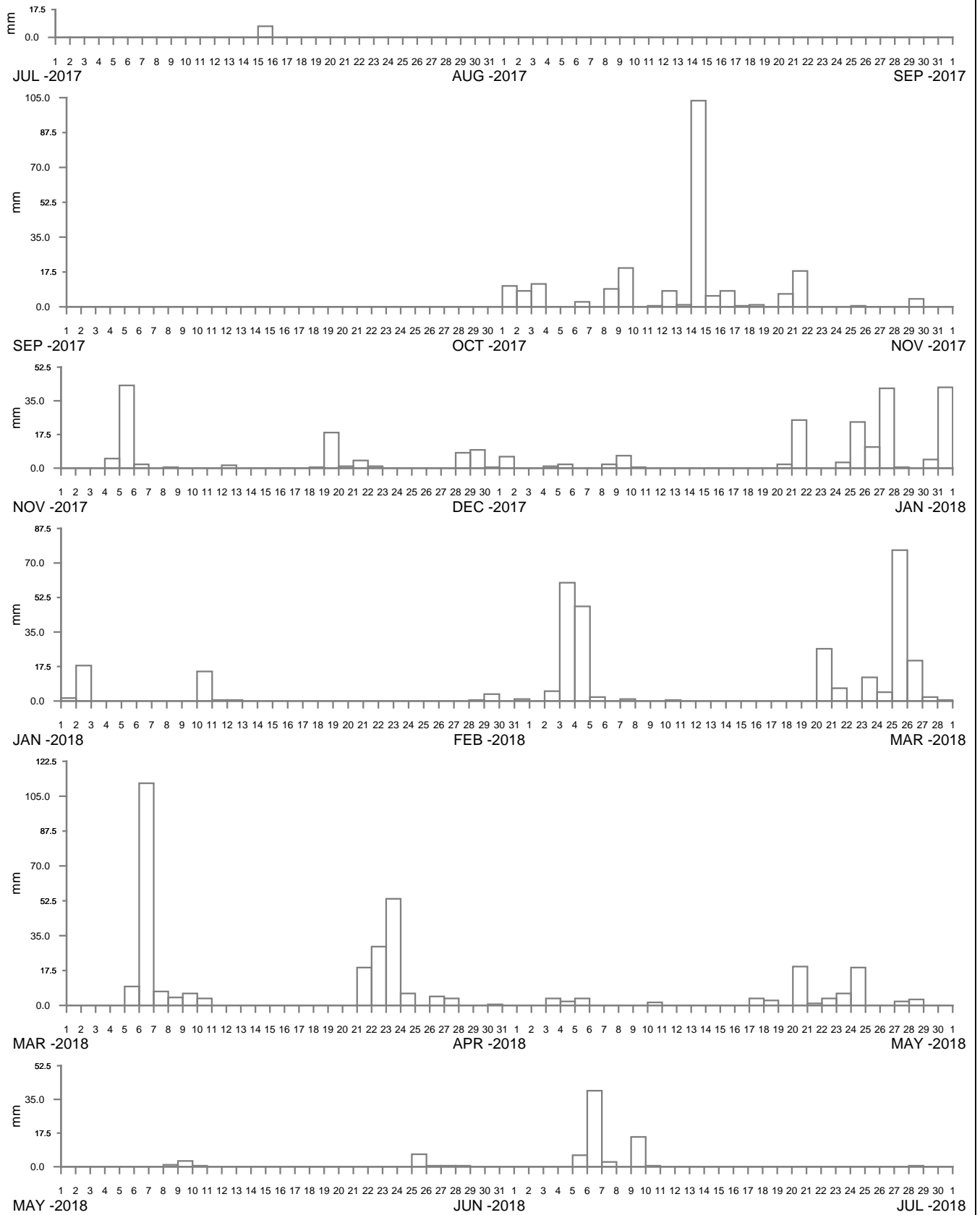




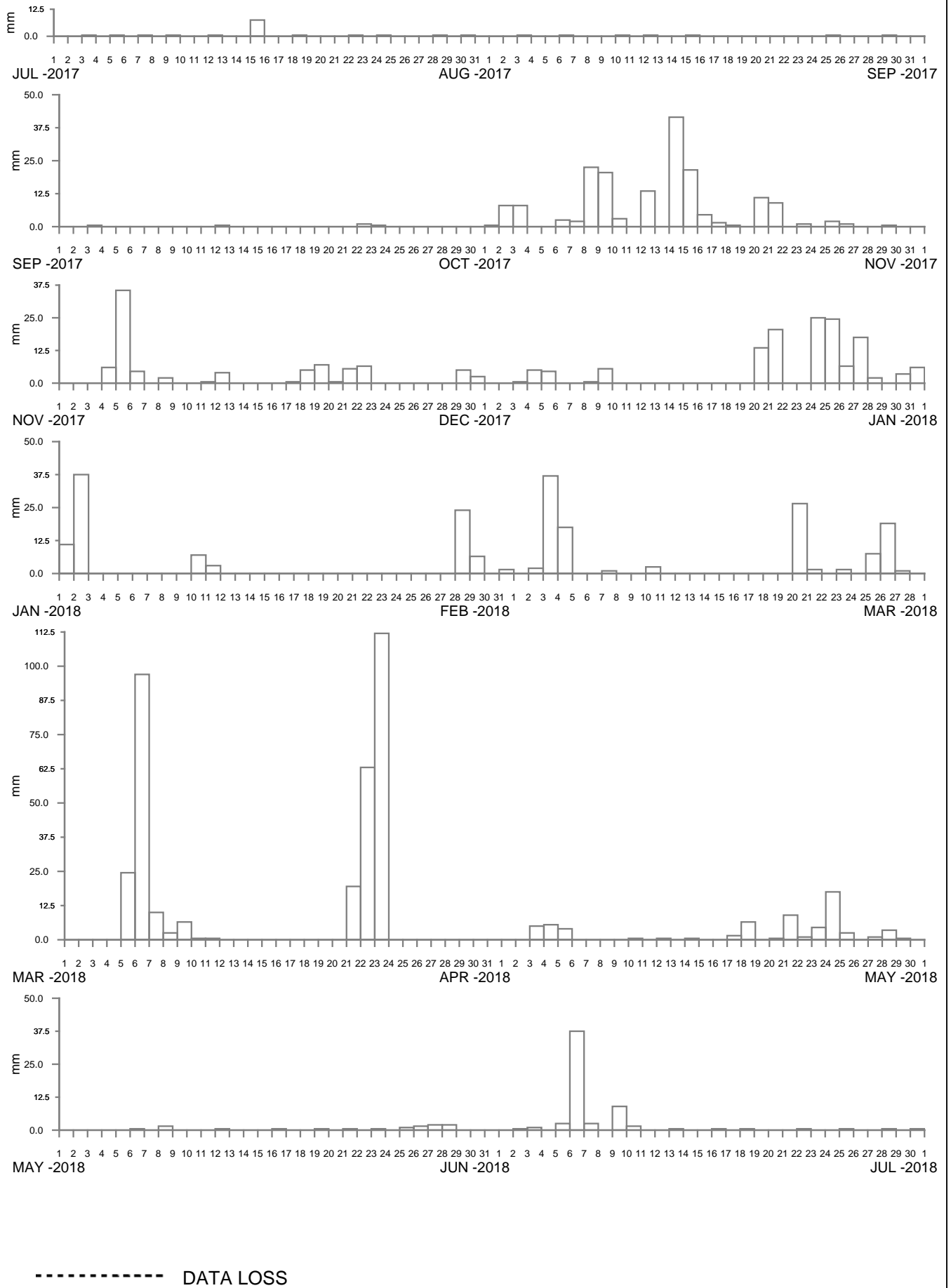


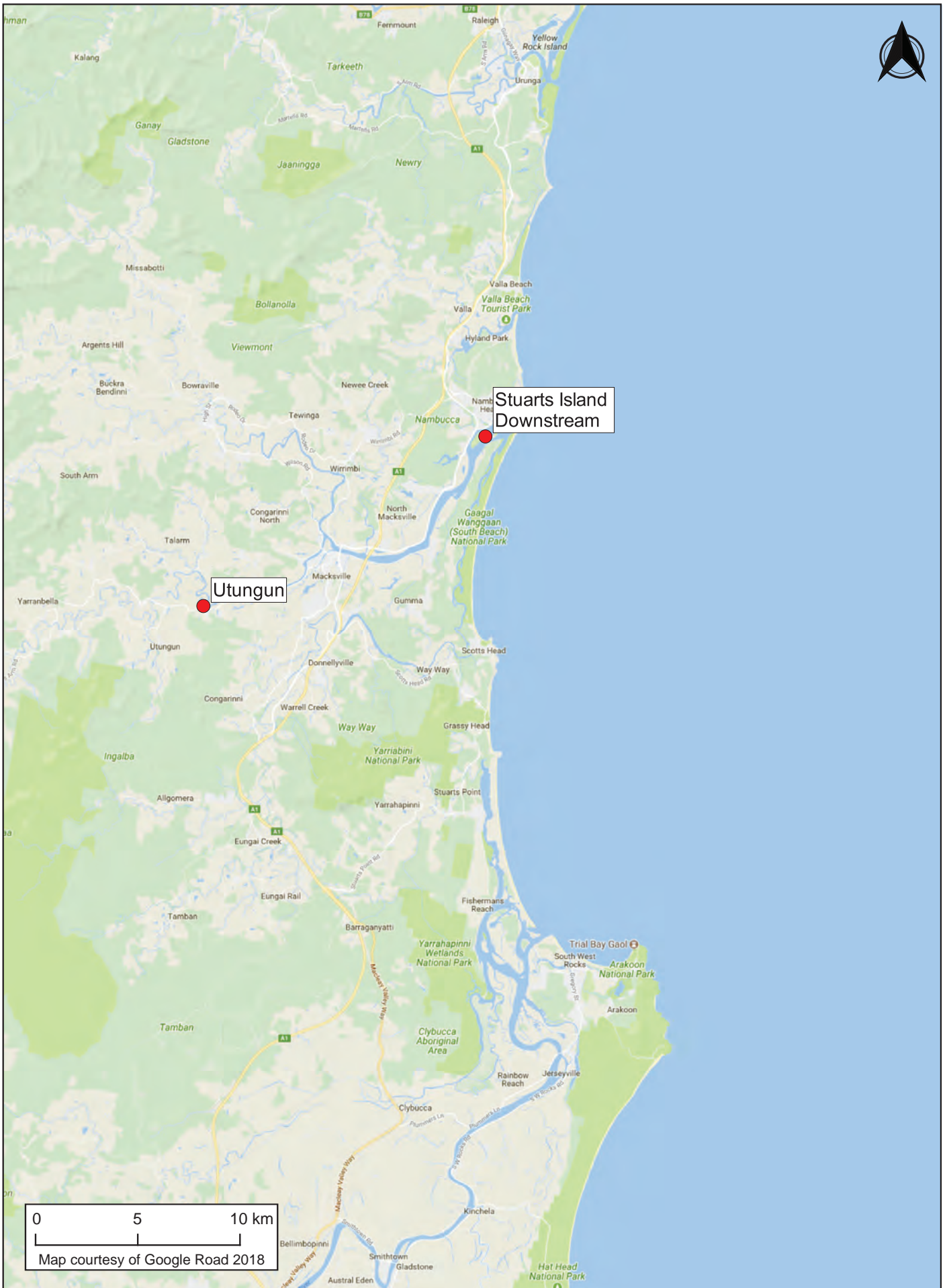
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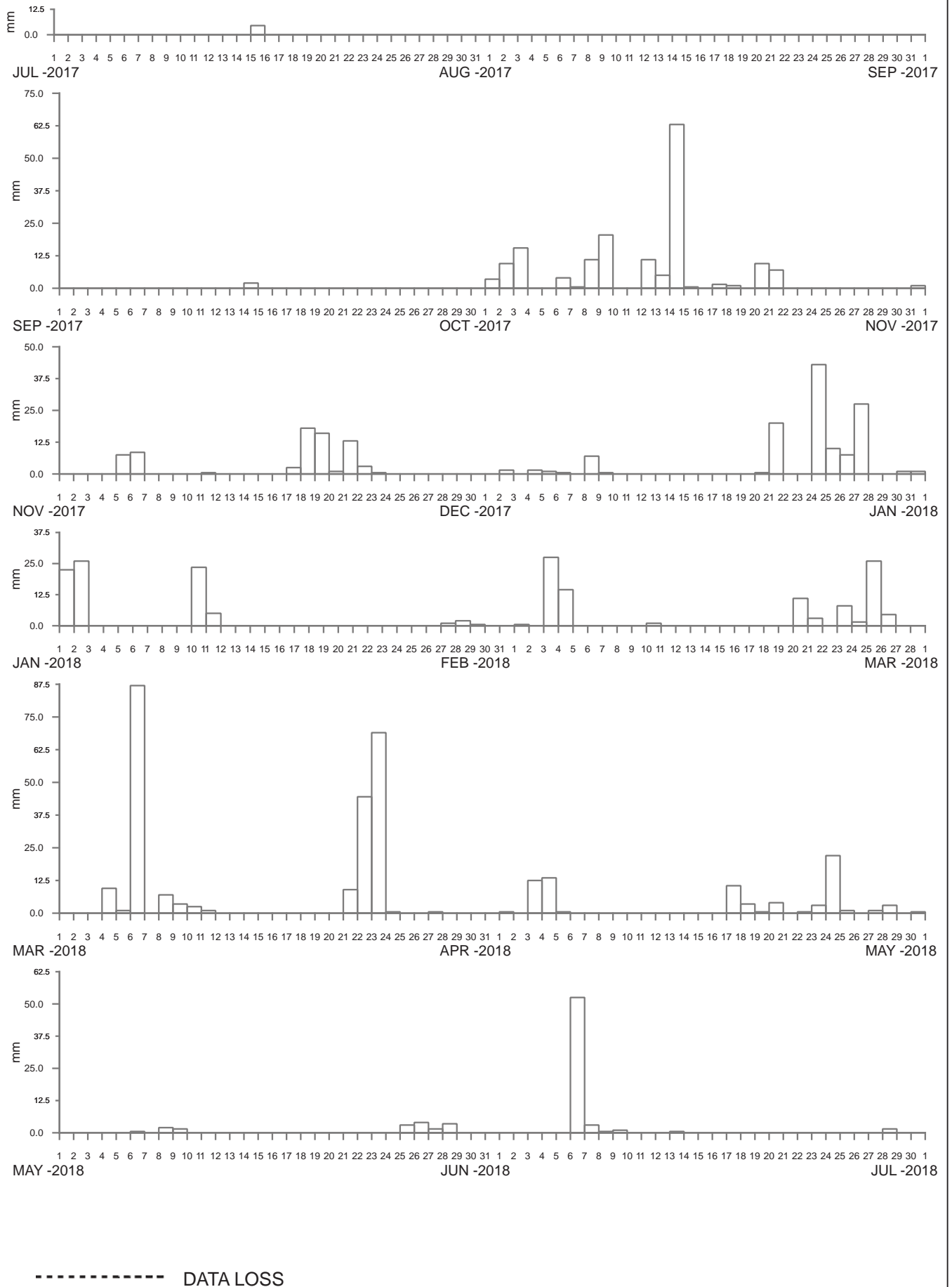


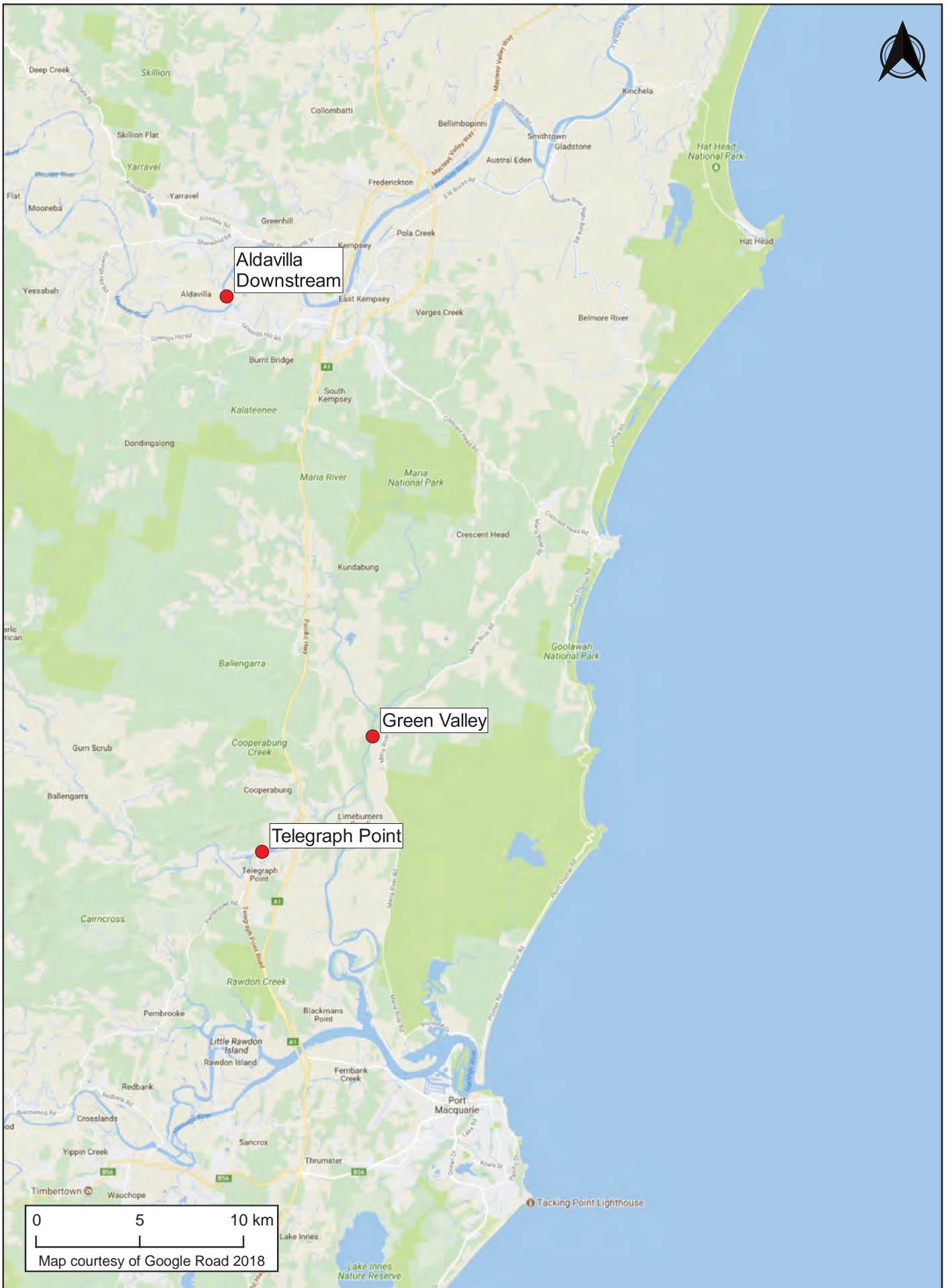
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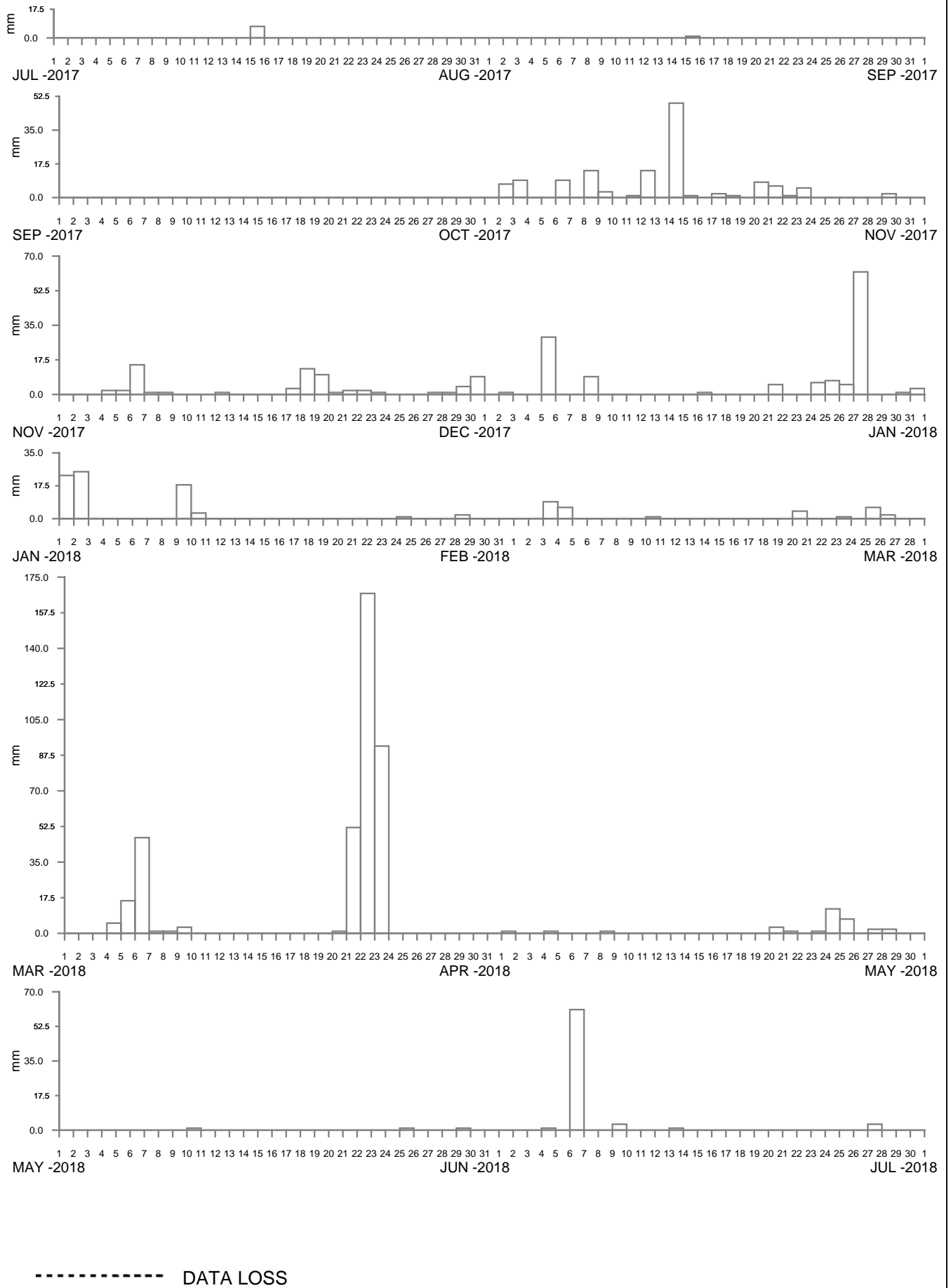


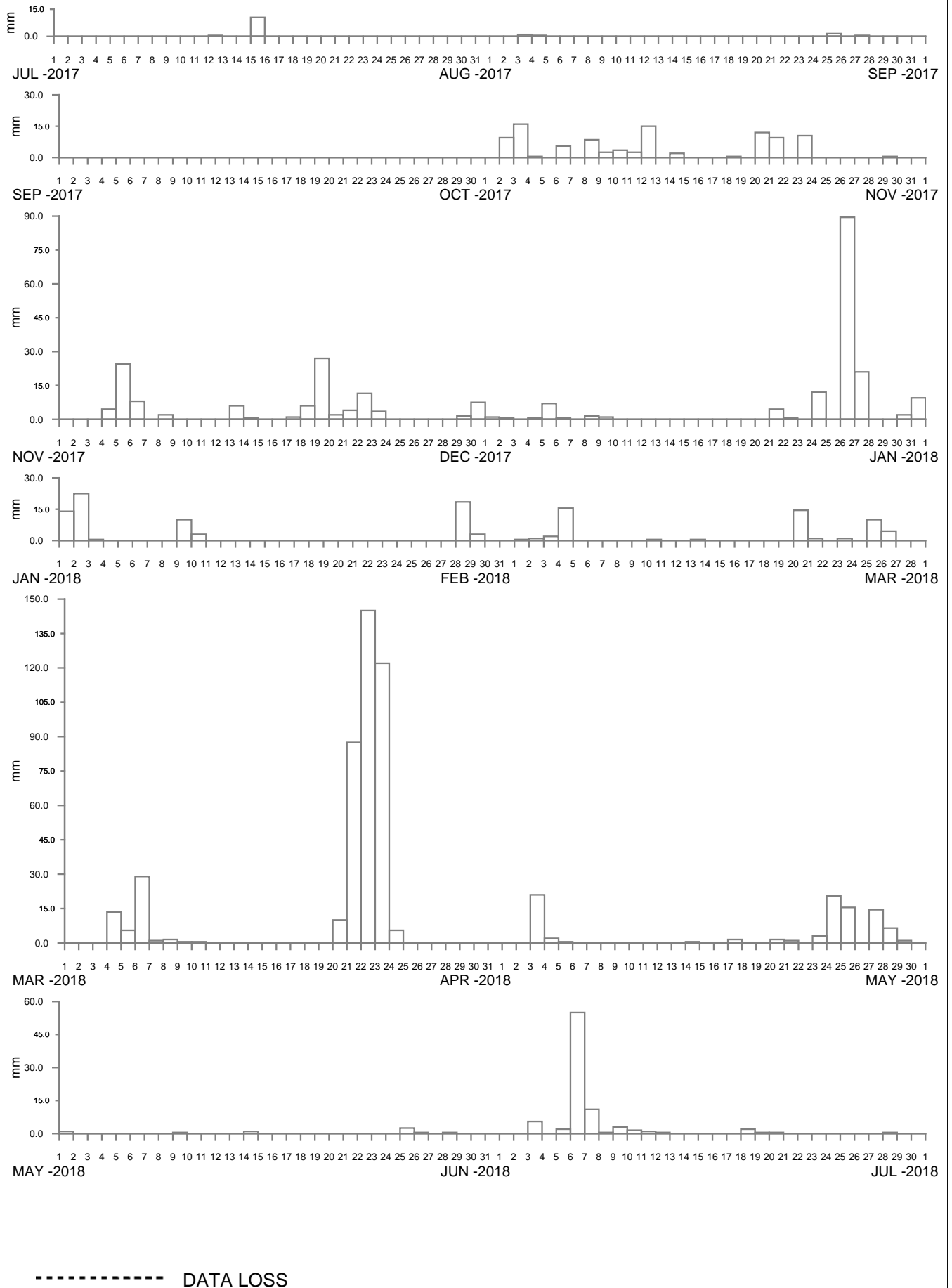


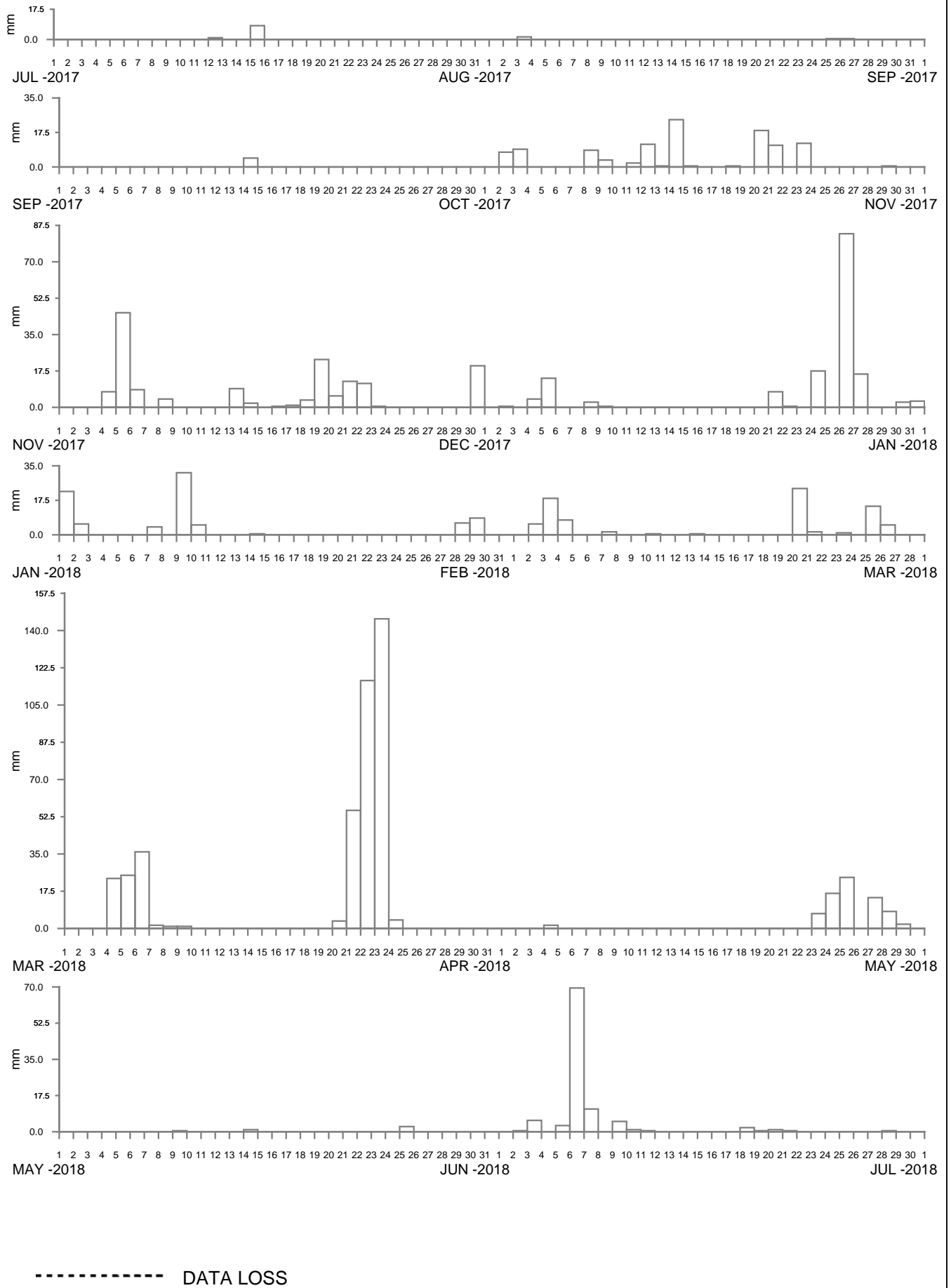
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Map courtesy of Google Road 2018

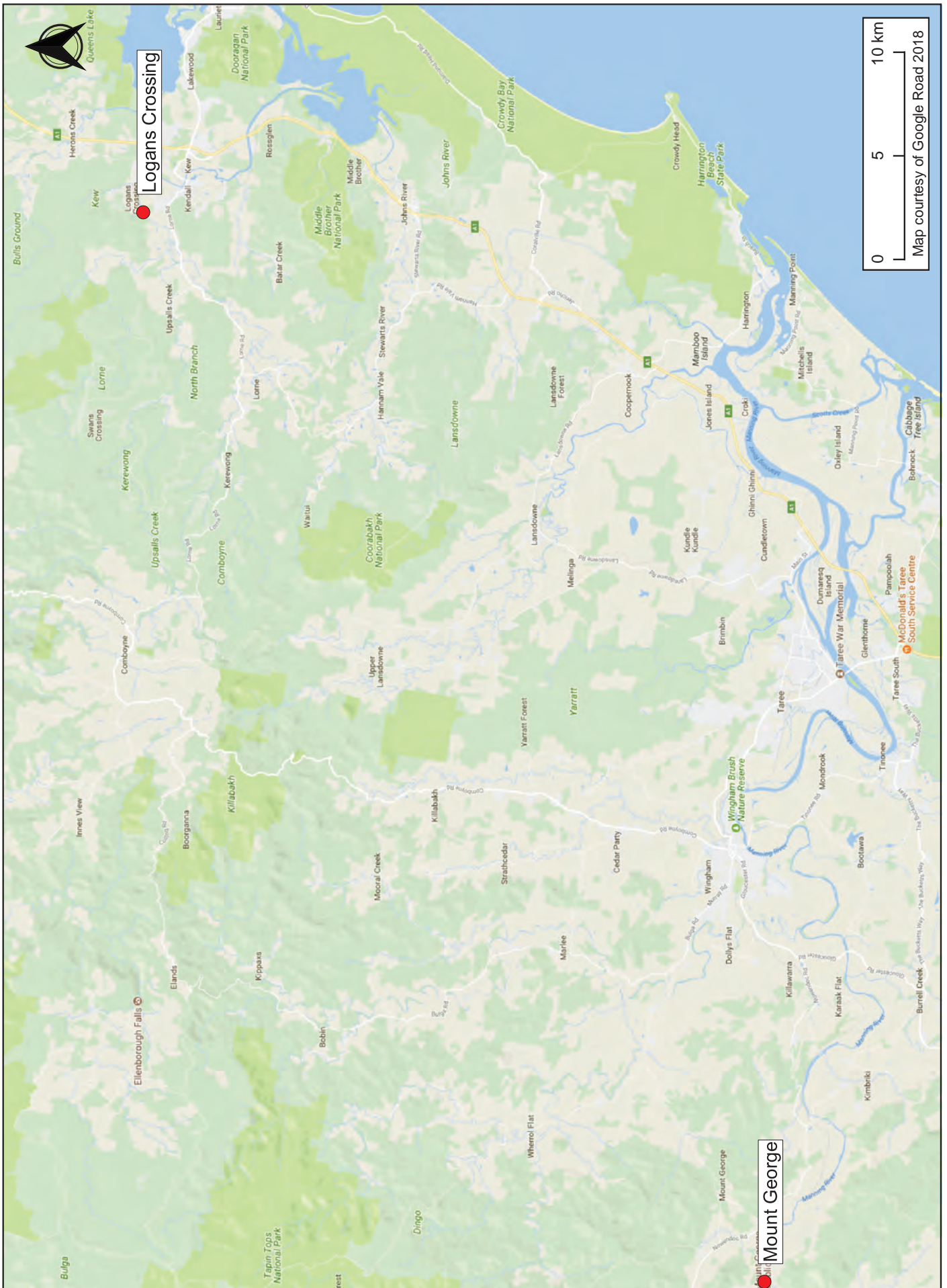


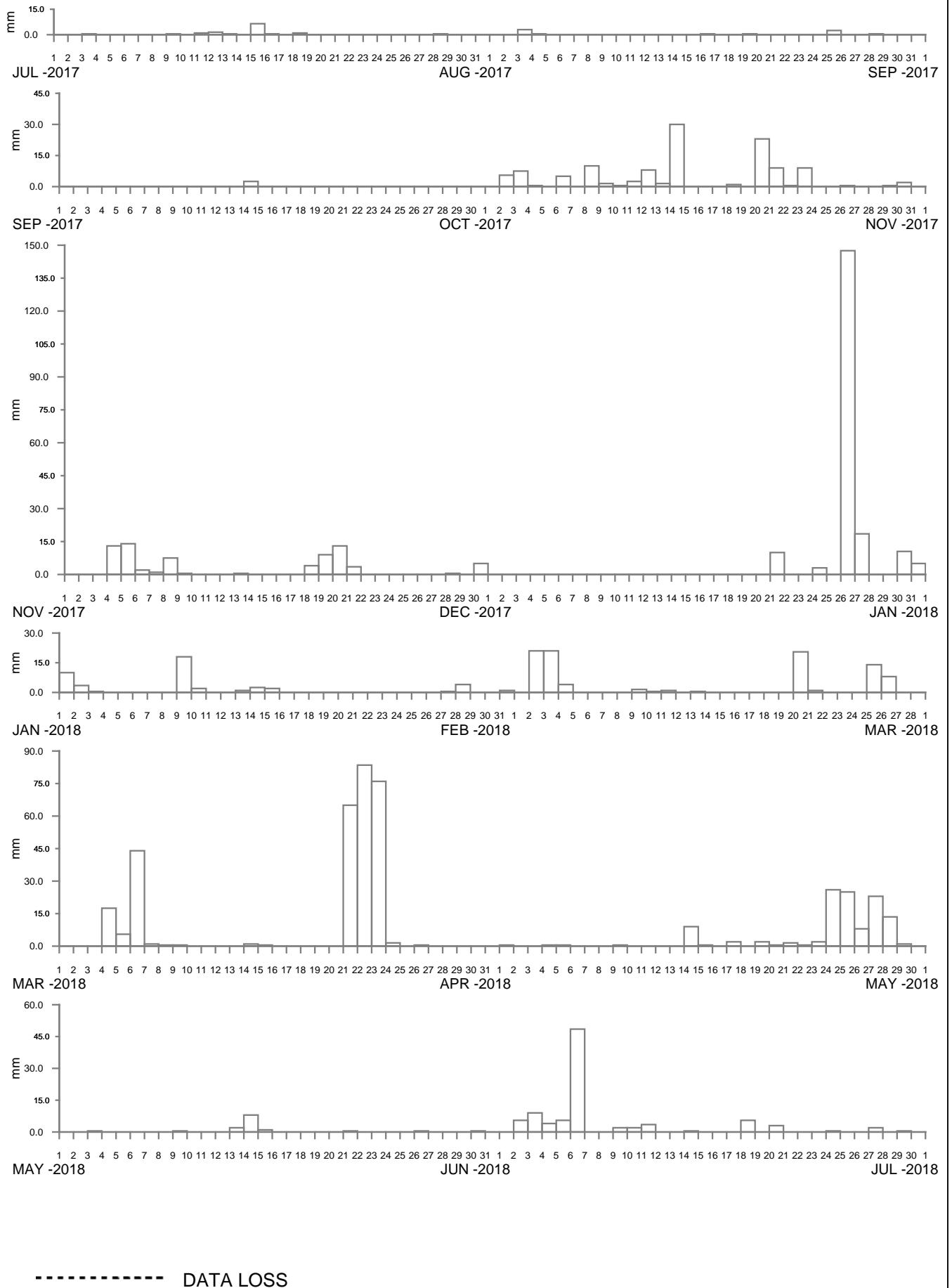


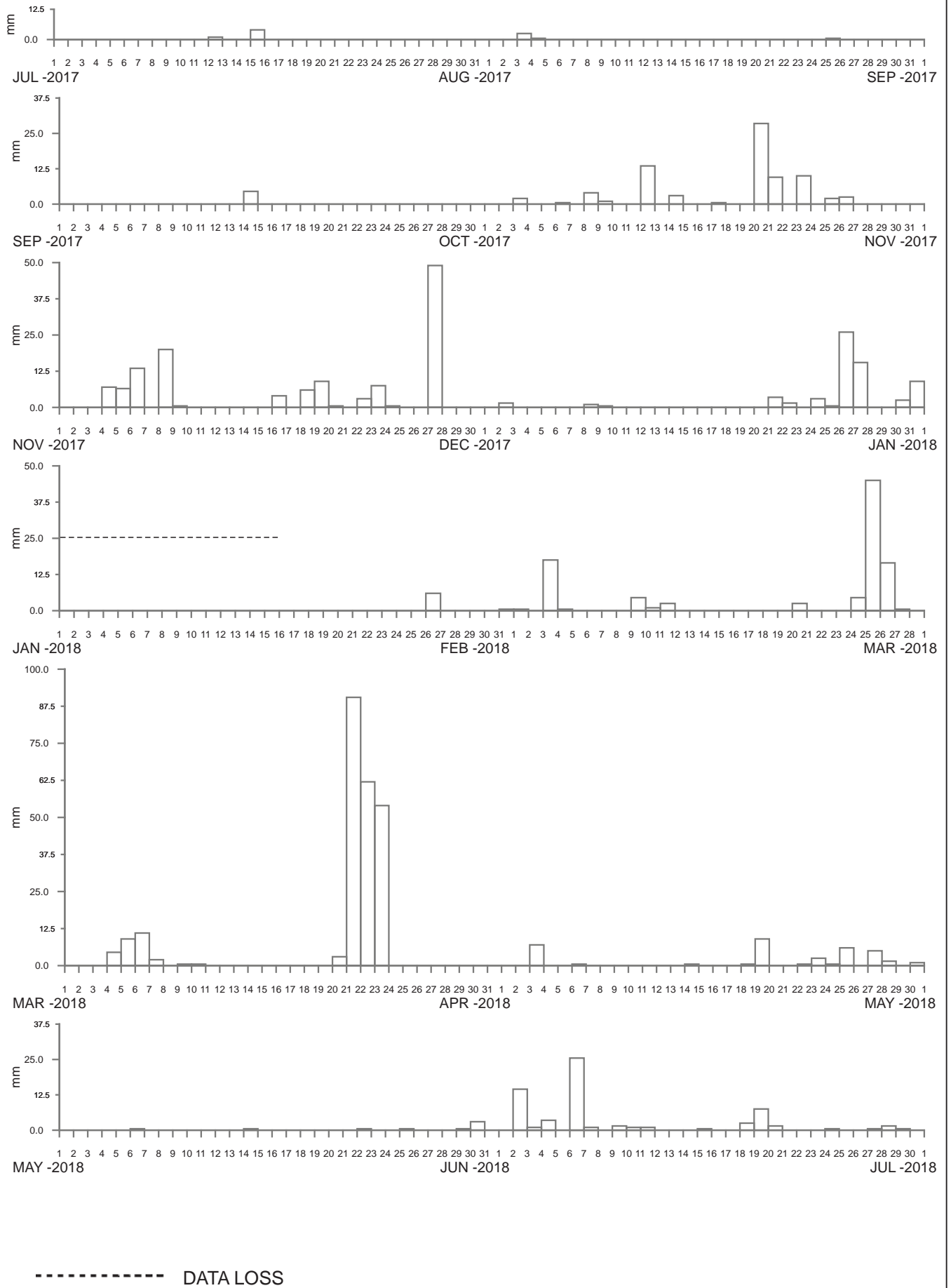


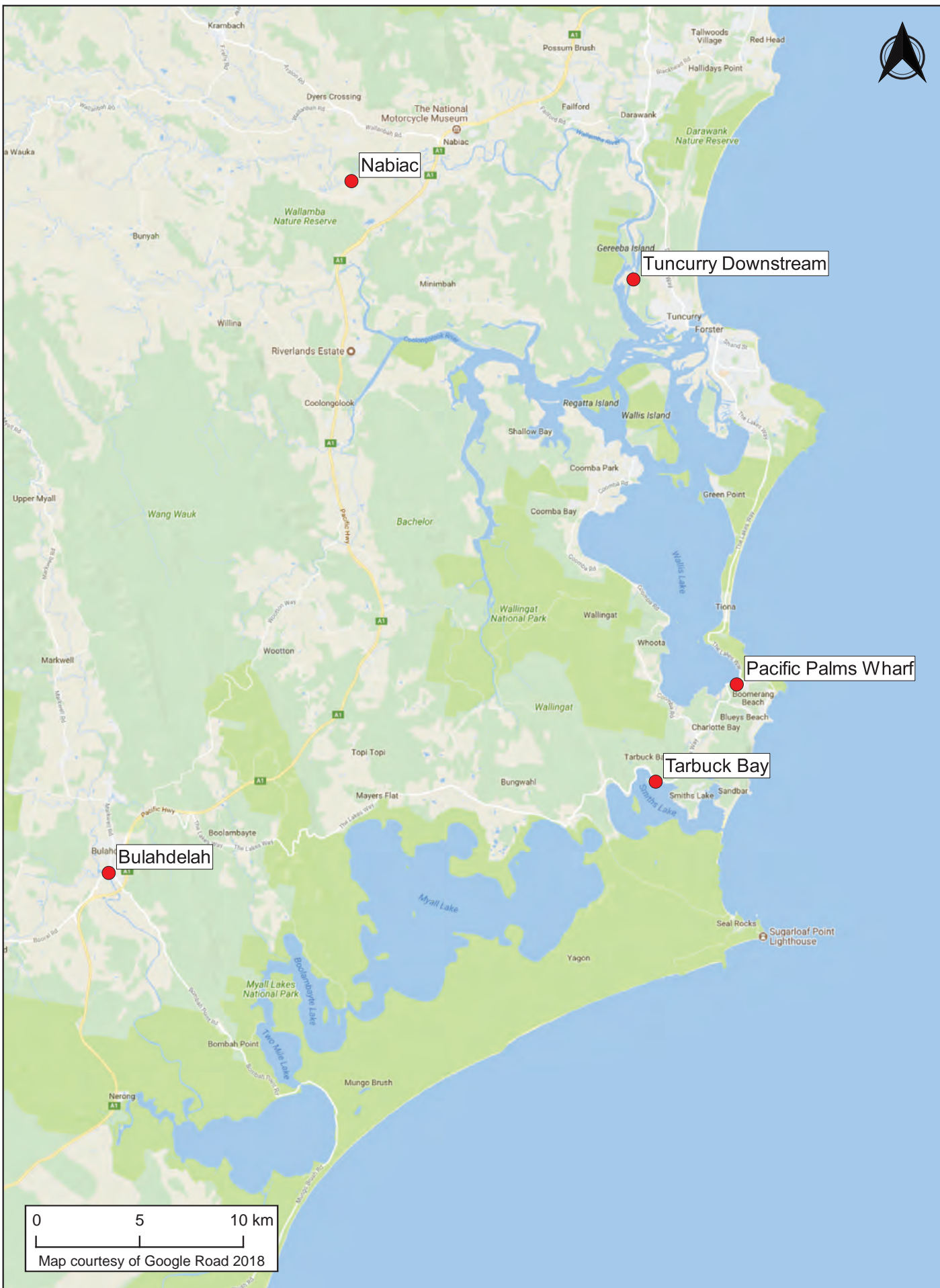




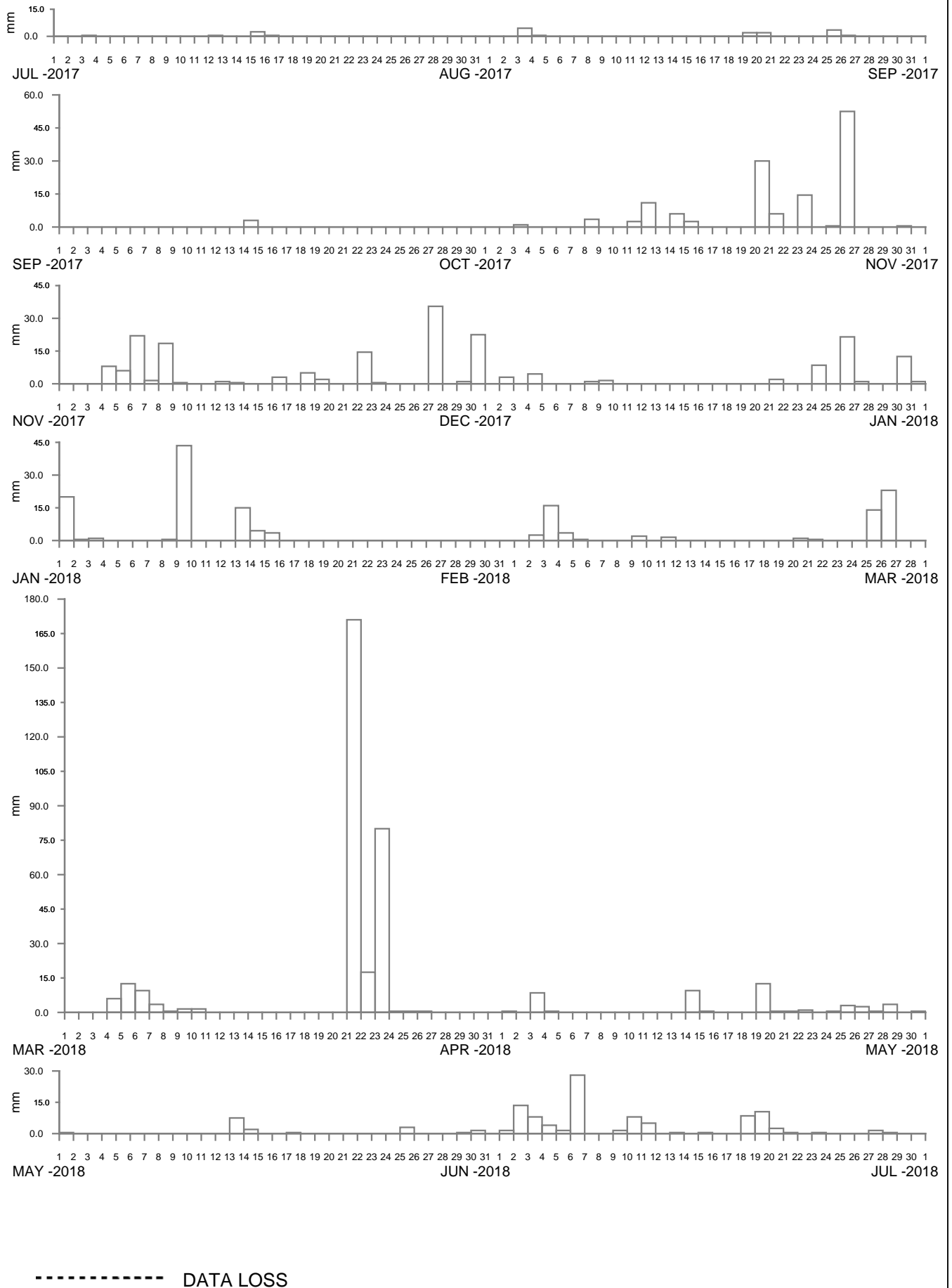


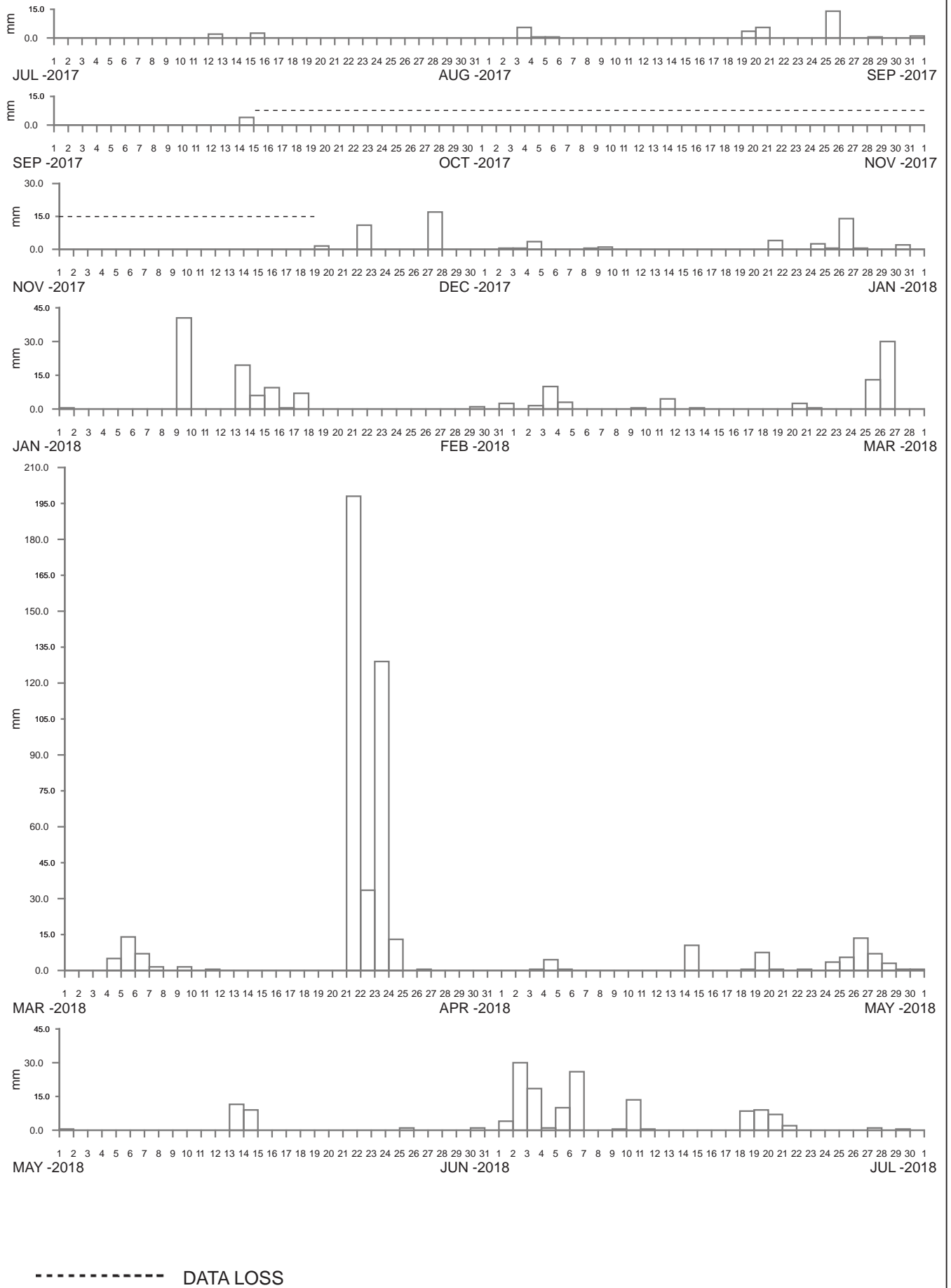


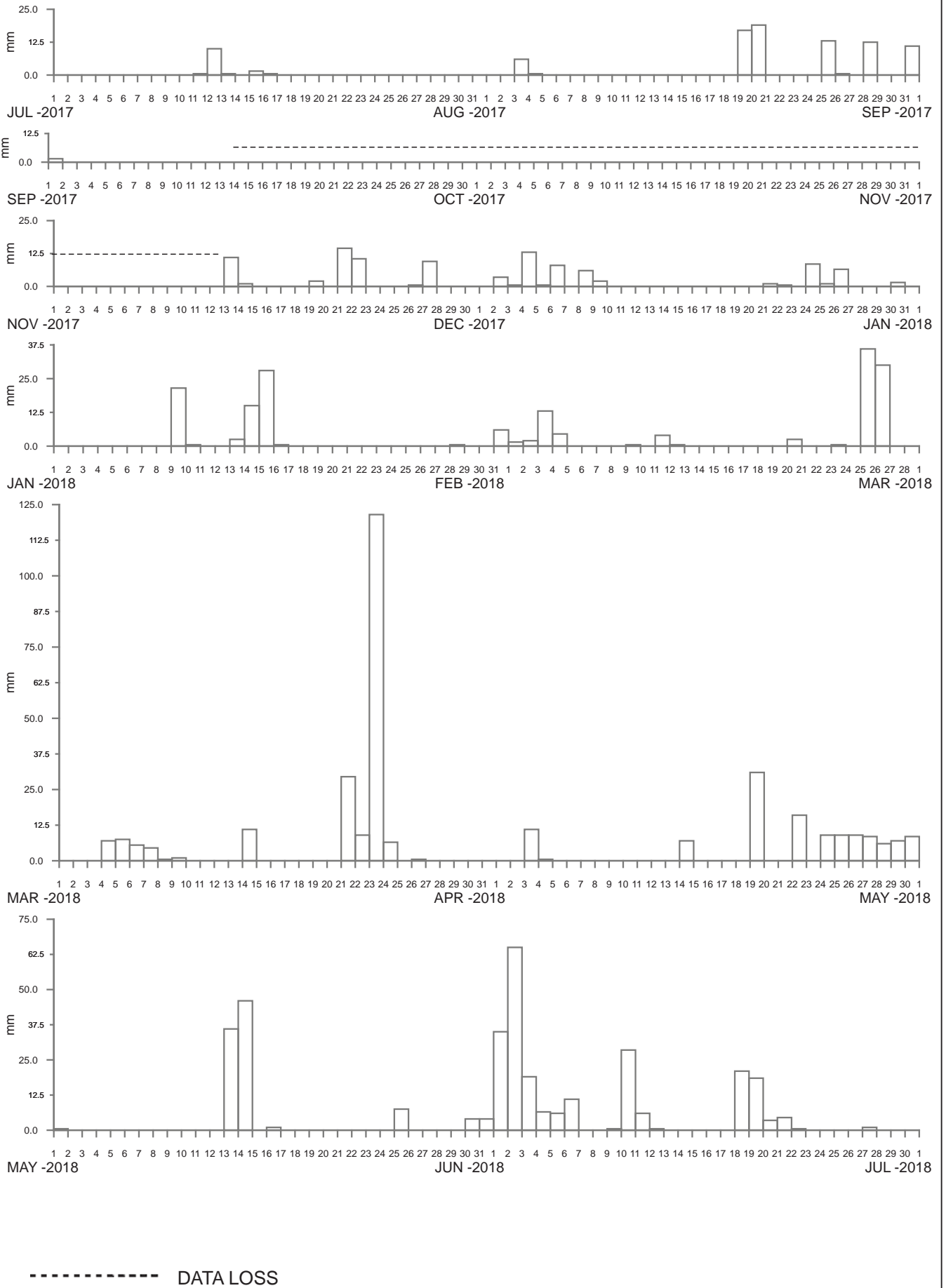


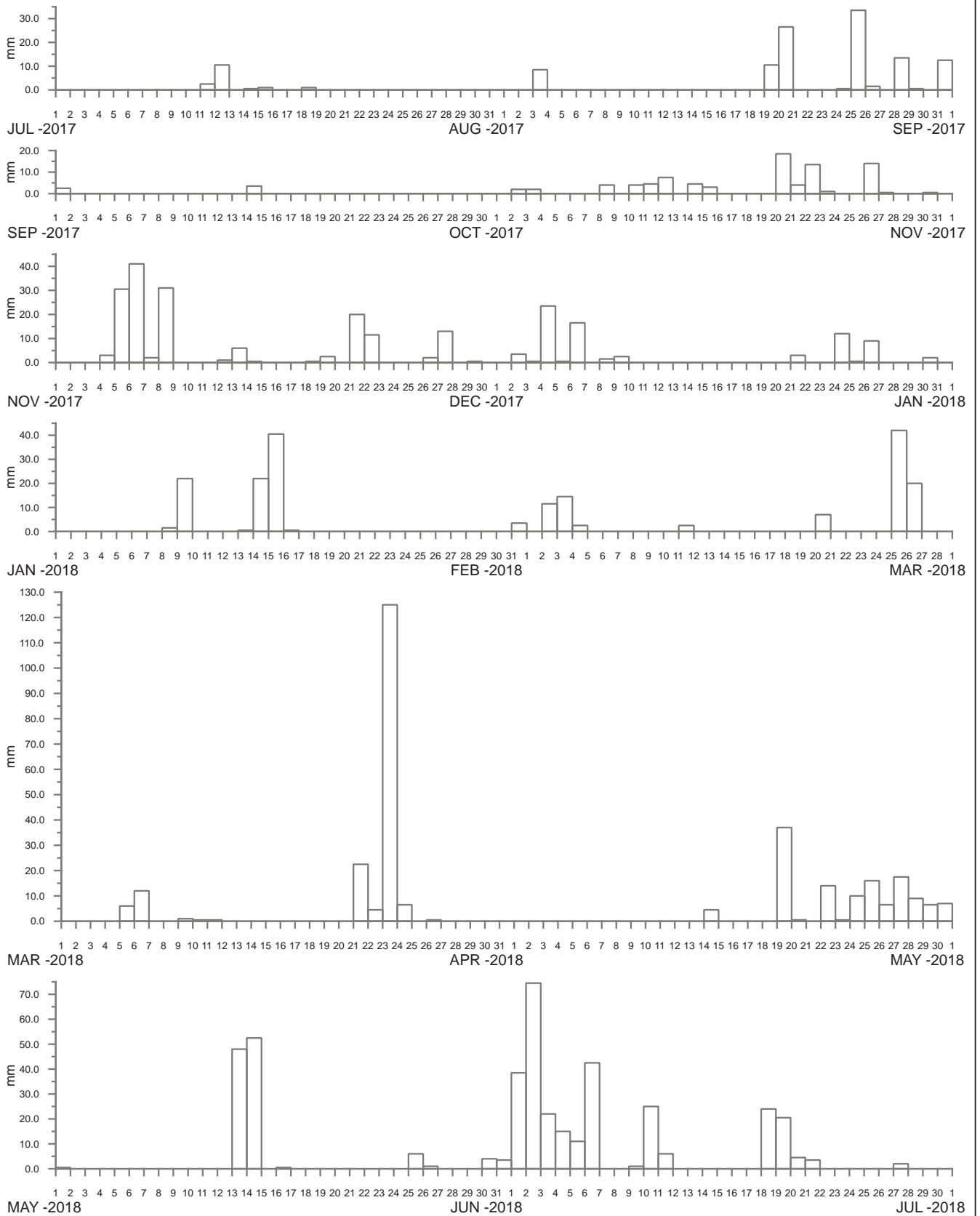


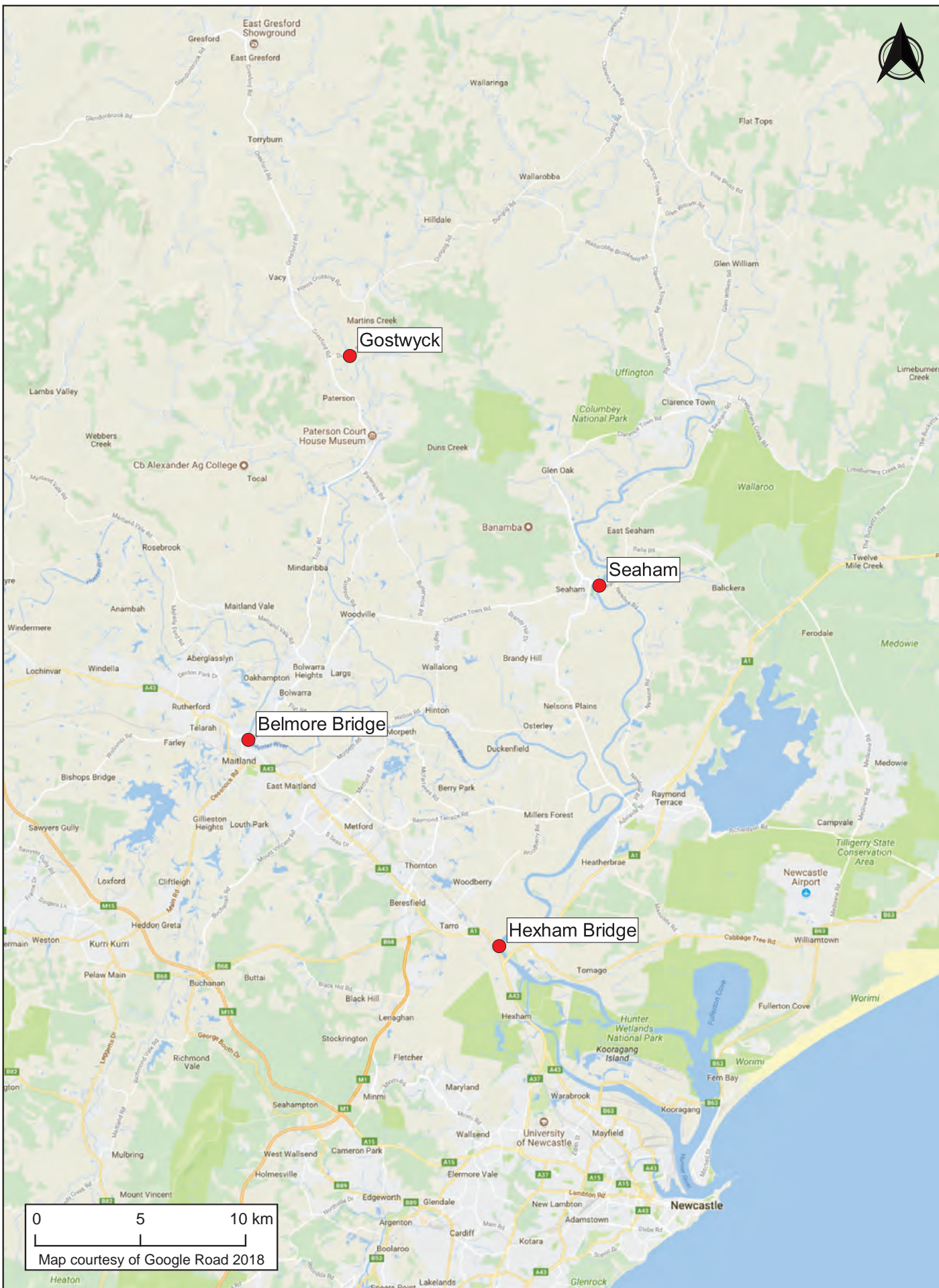
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Map courtesy of Google Road 2018



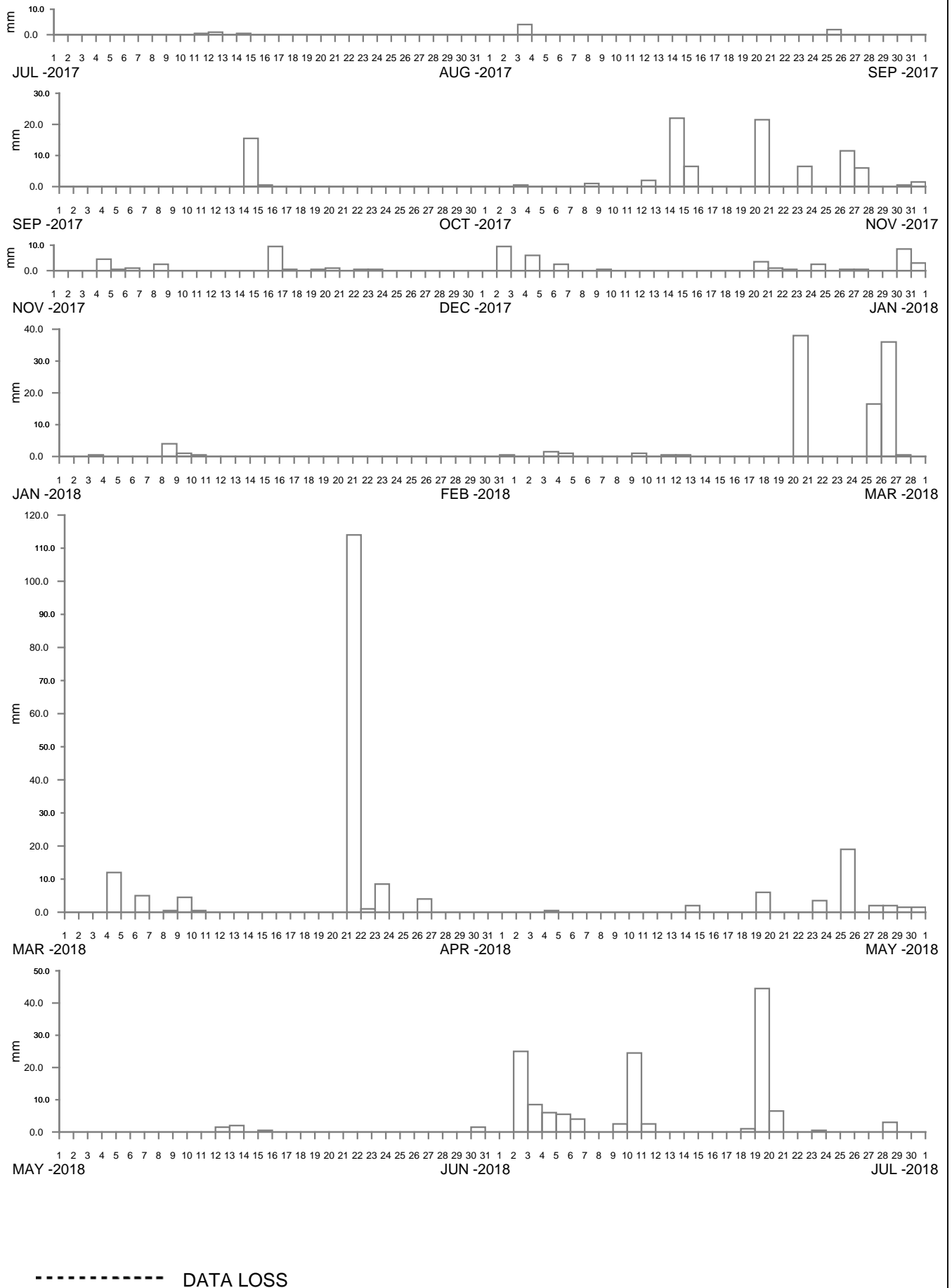


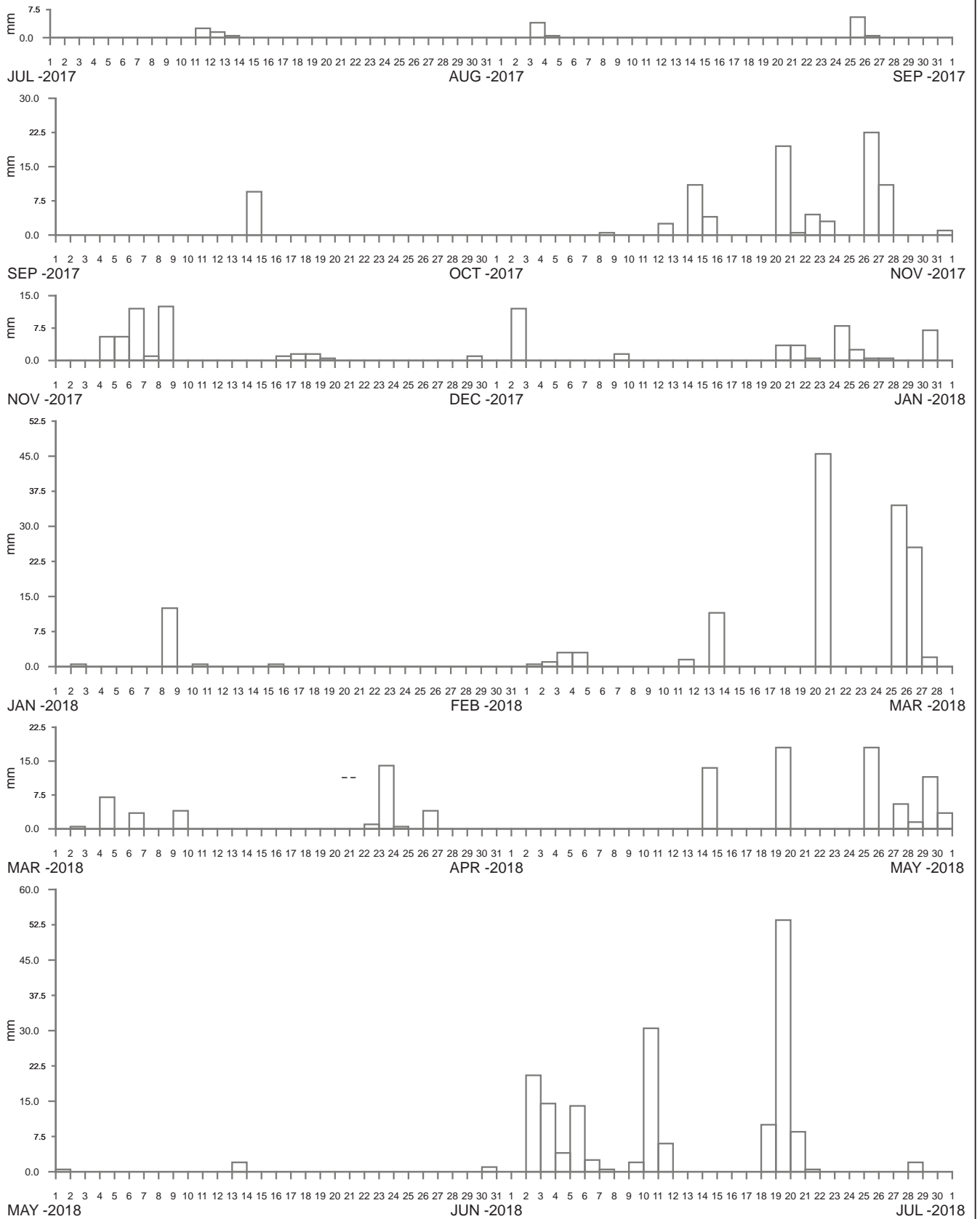


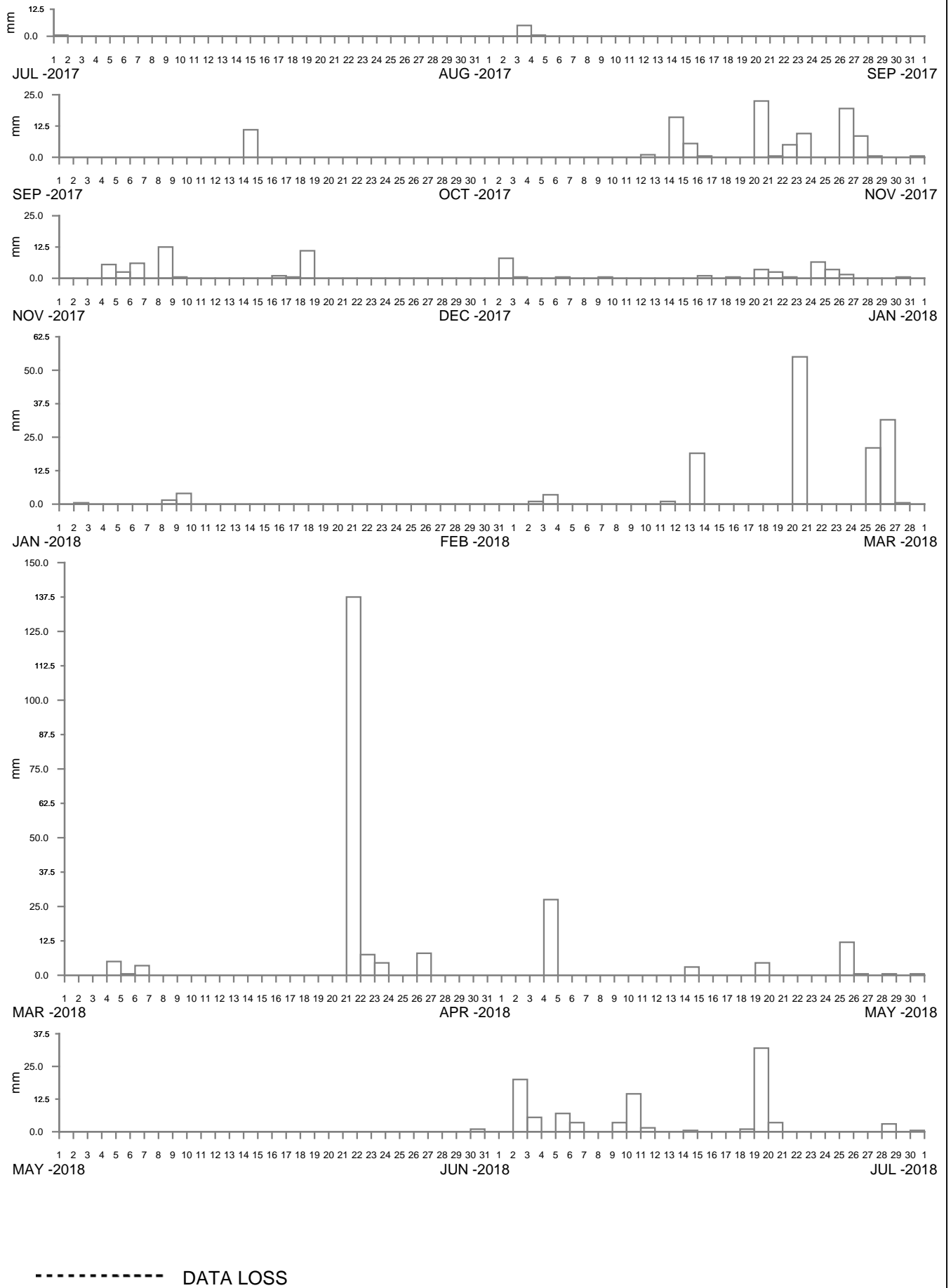


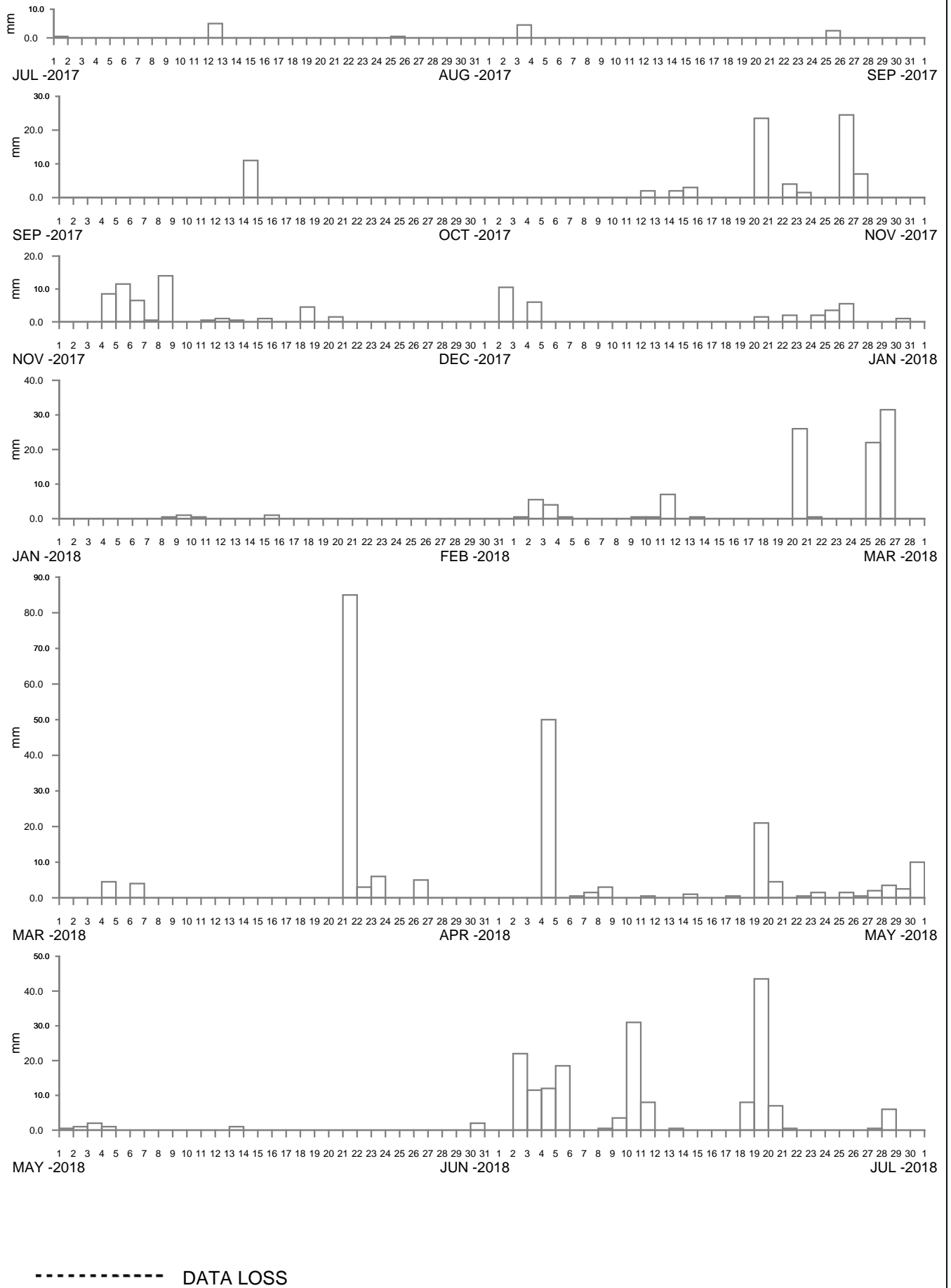


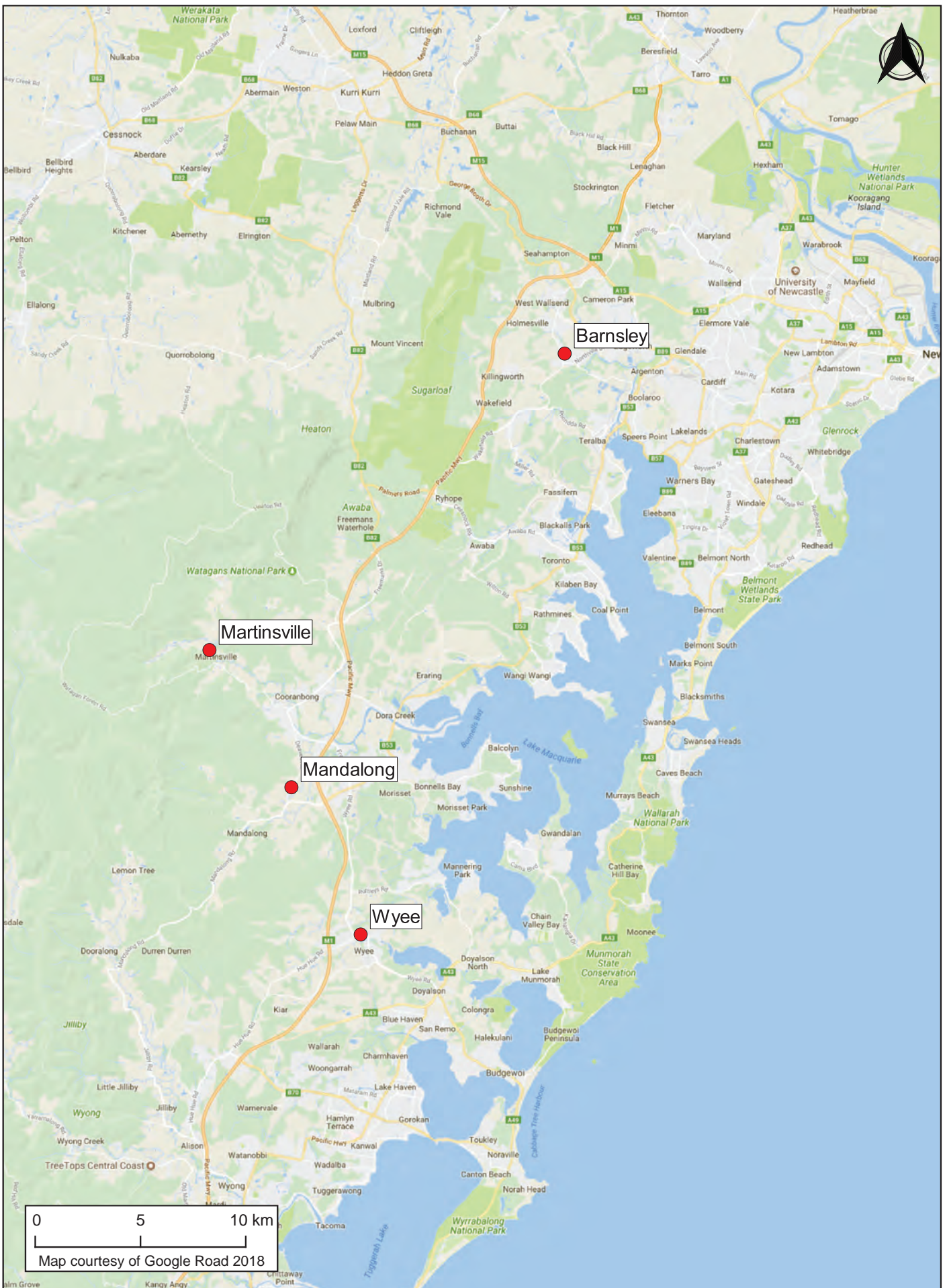
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Map courtesy of Google Road 2018



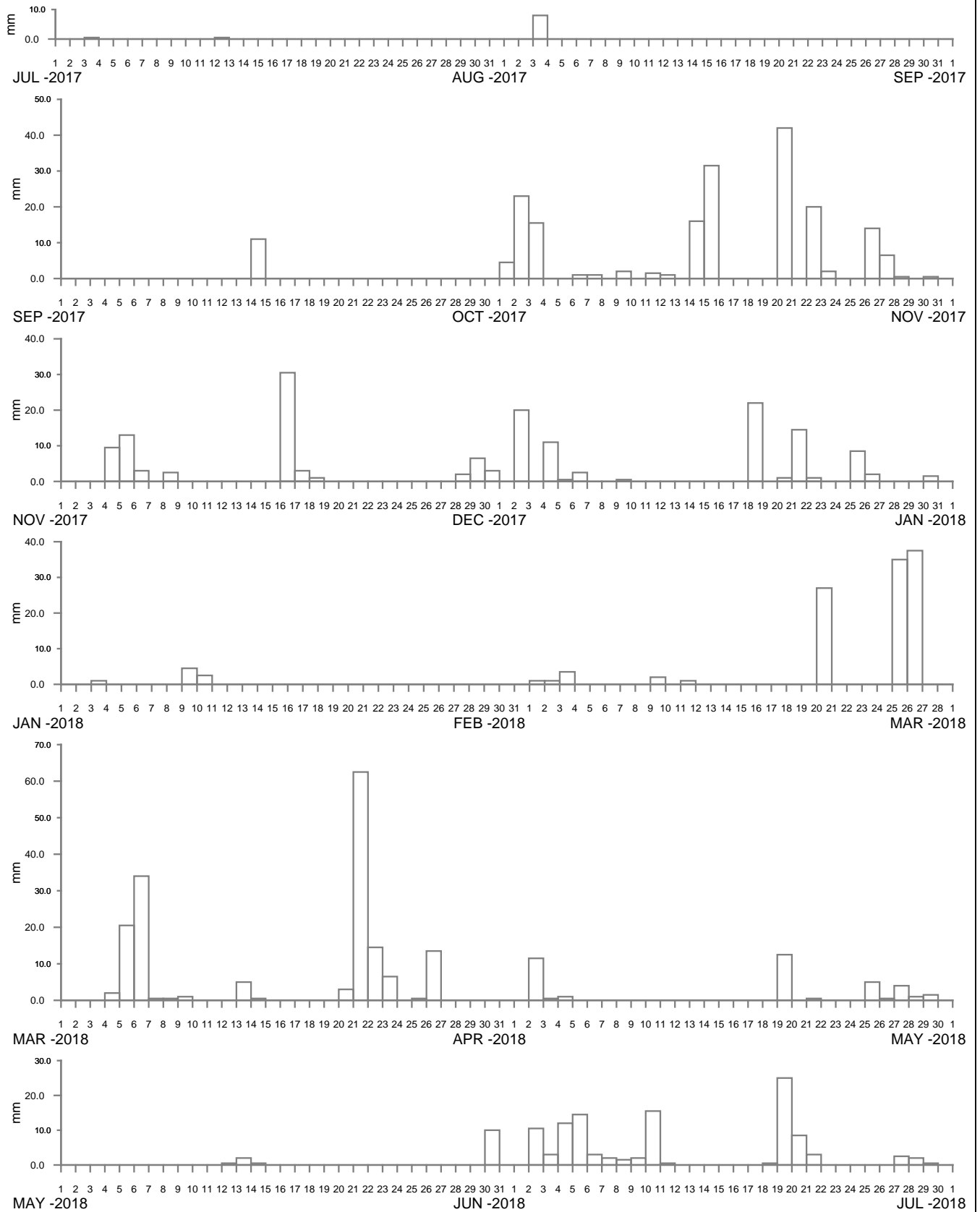




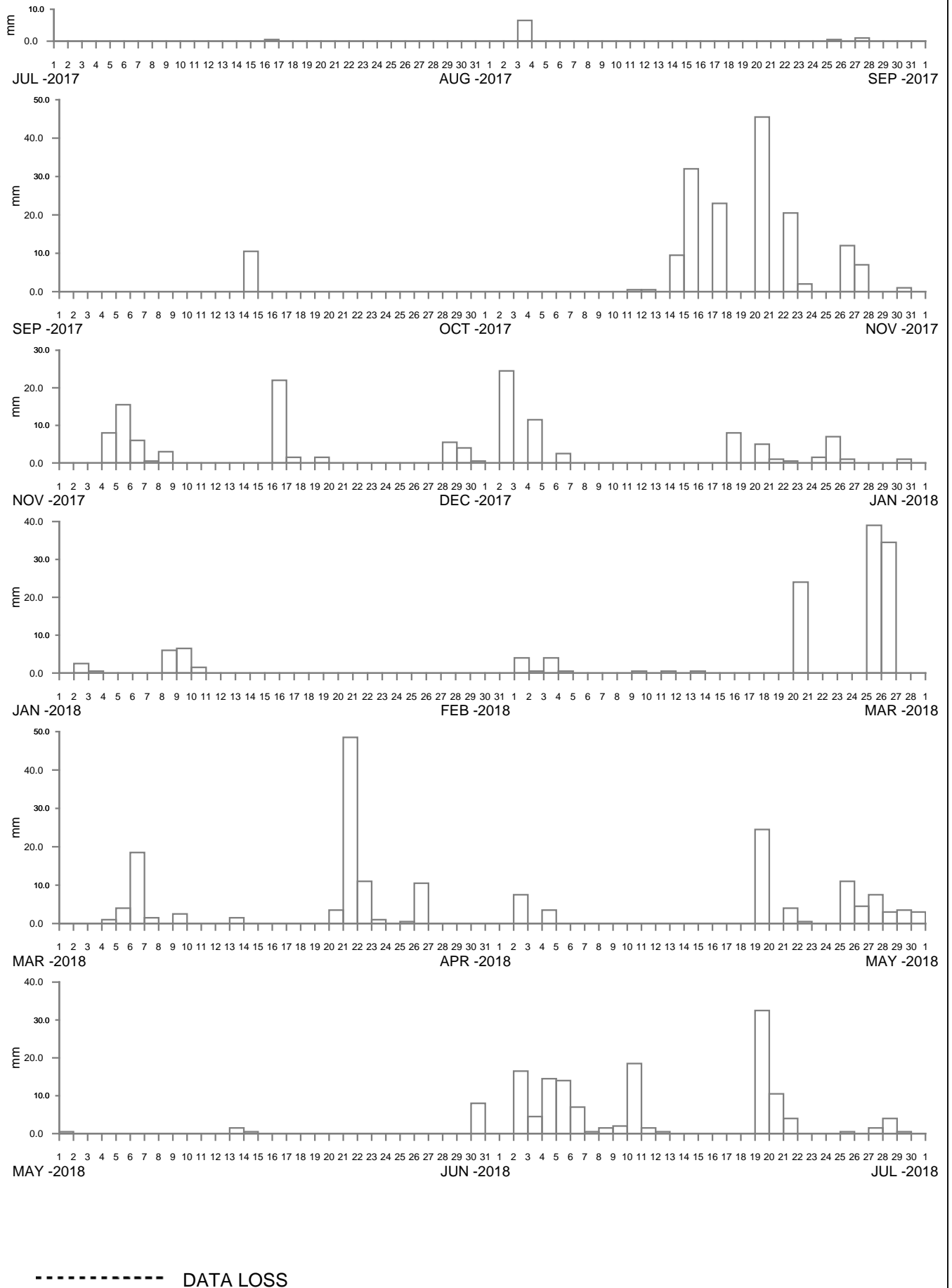


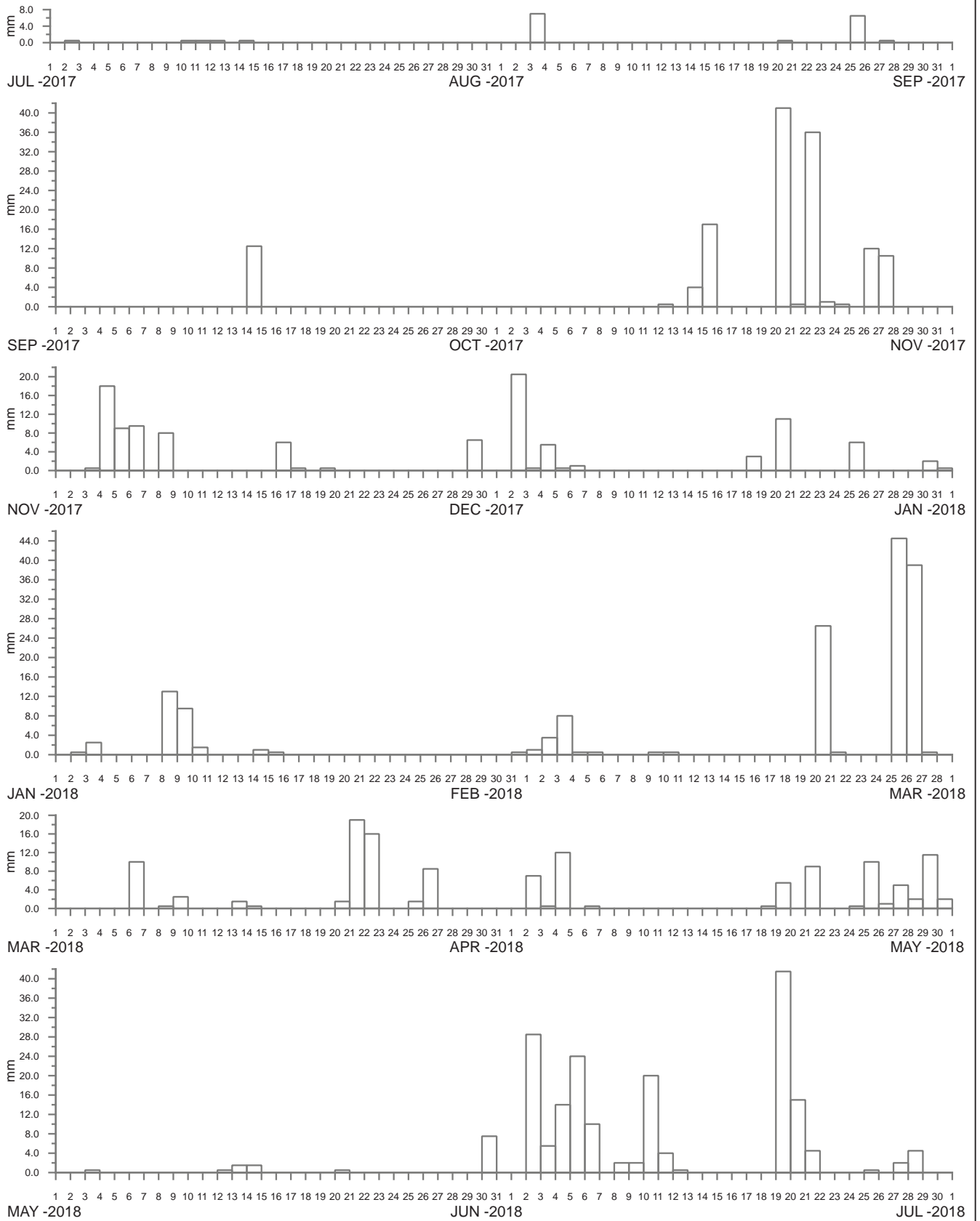


0 5 10 km
Map courtesy of Google Road 2018

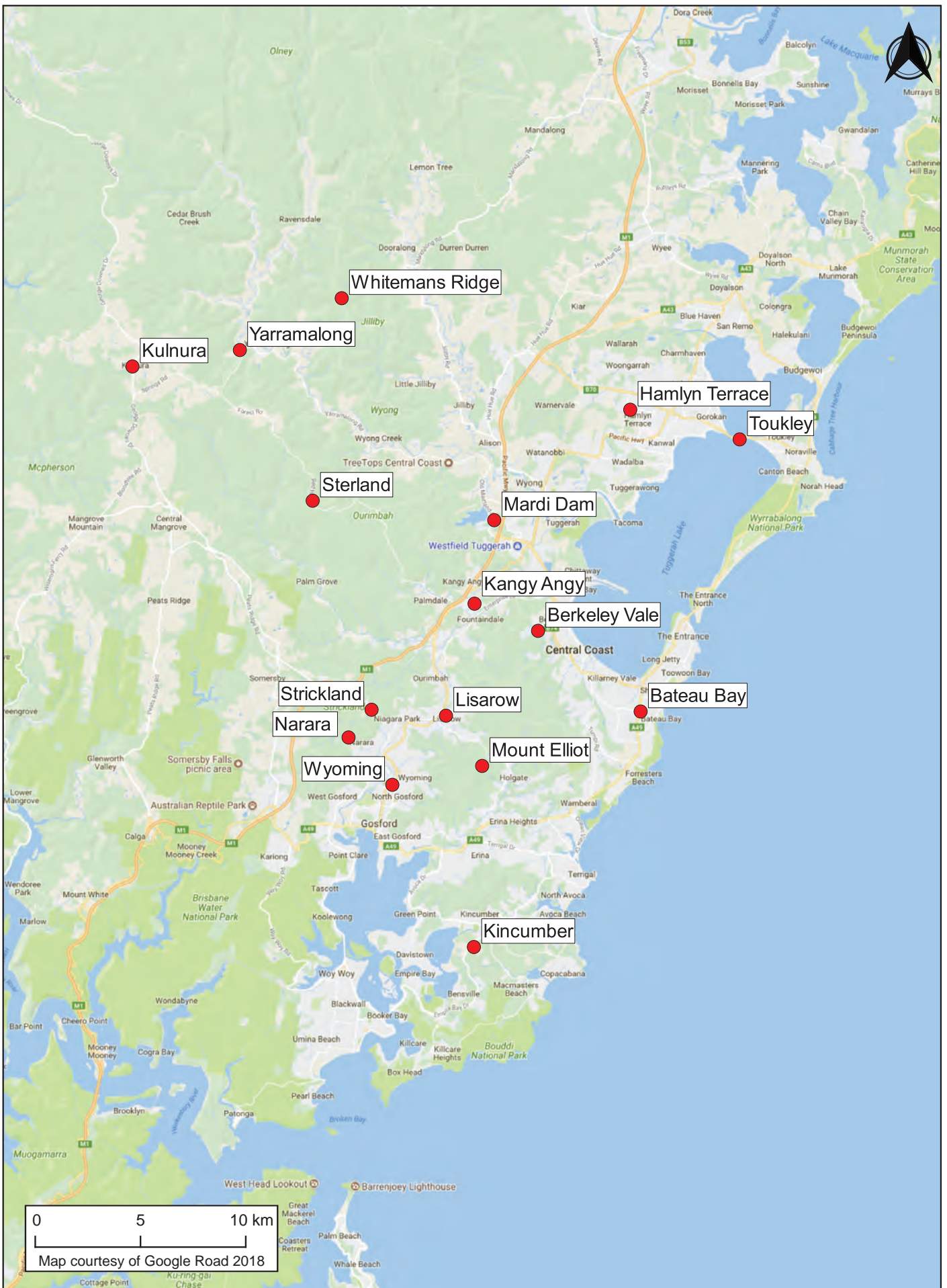


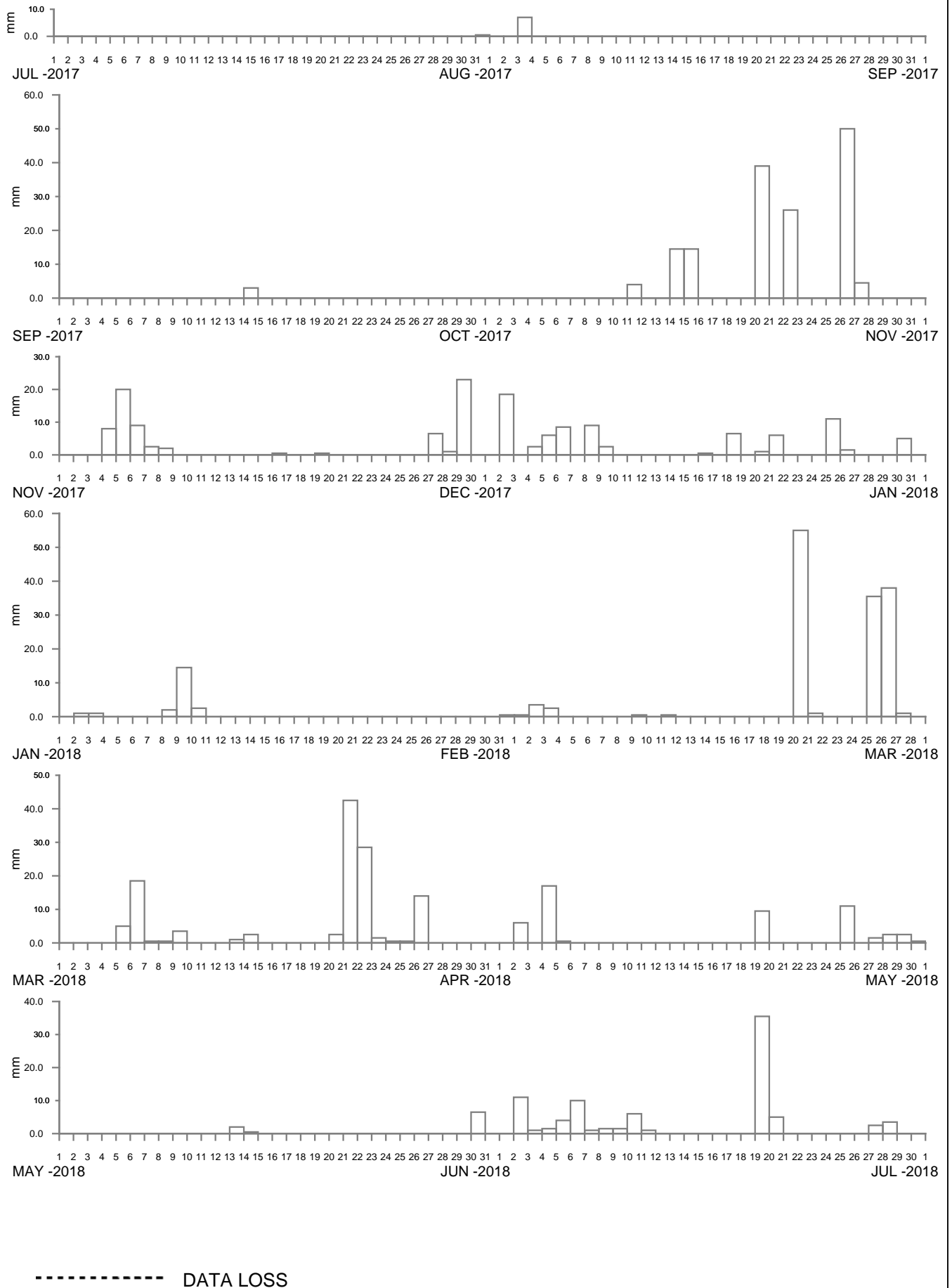
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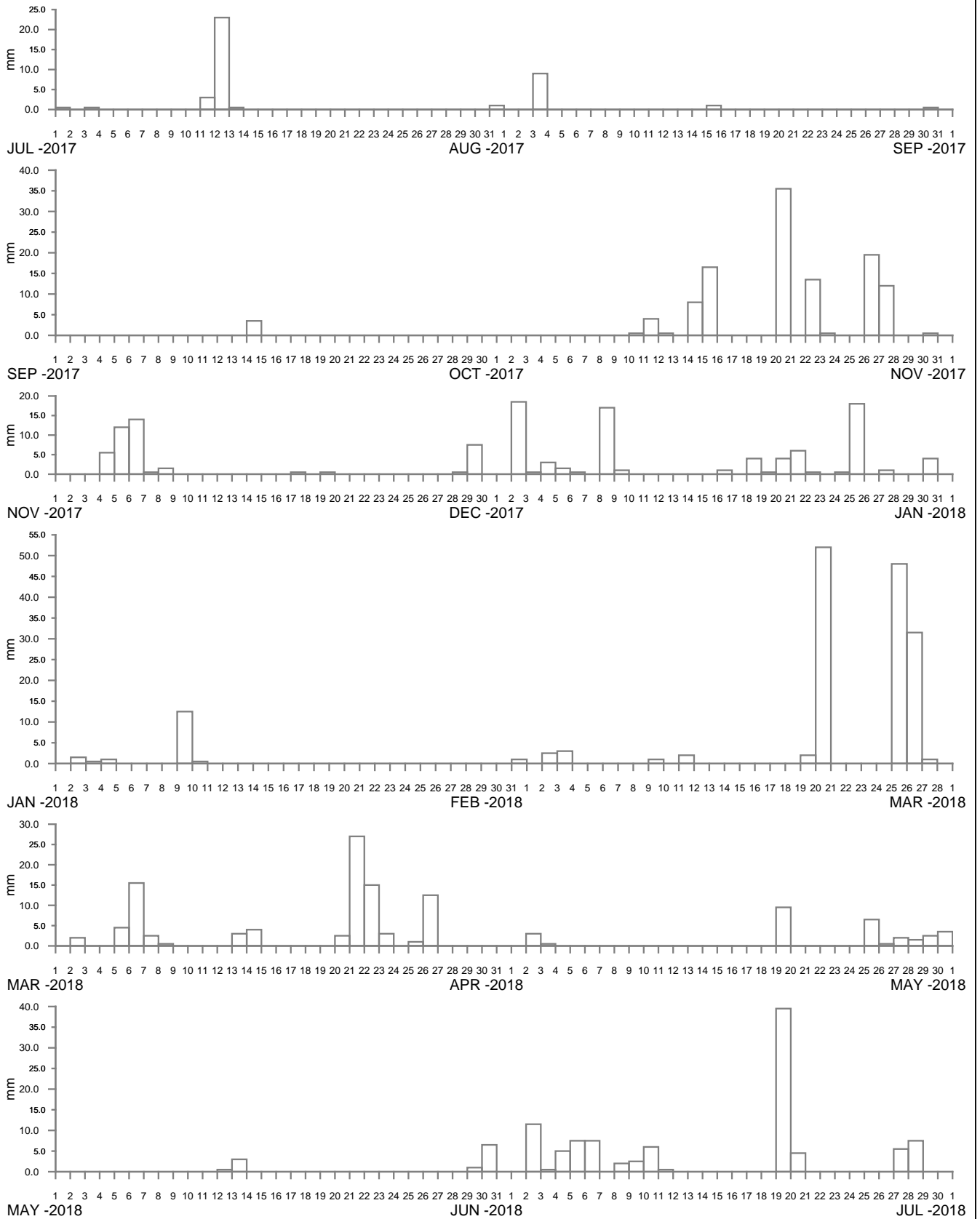




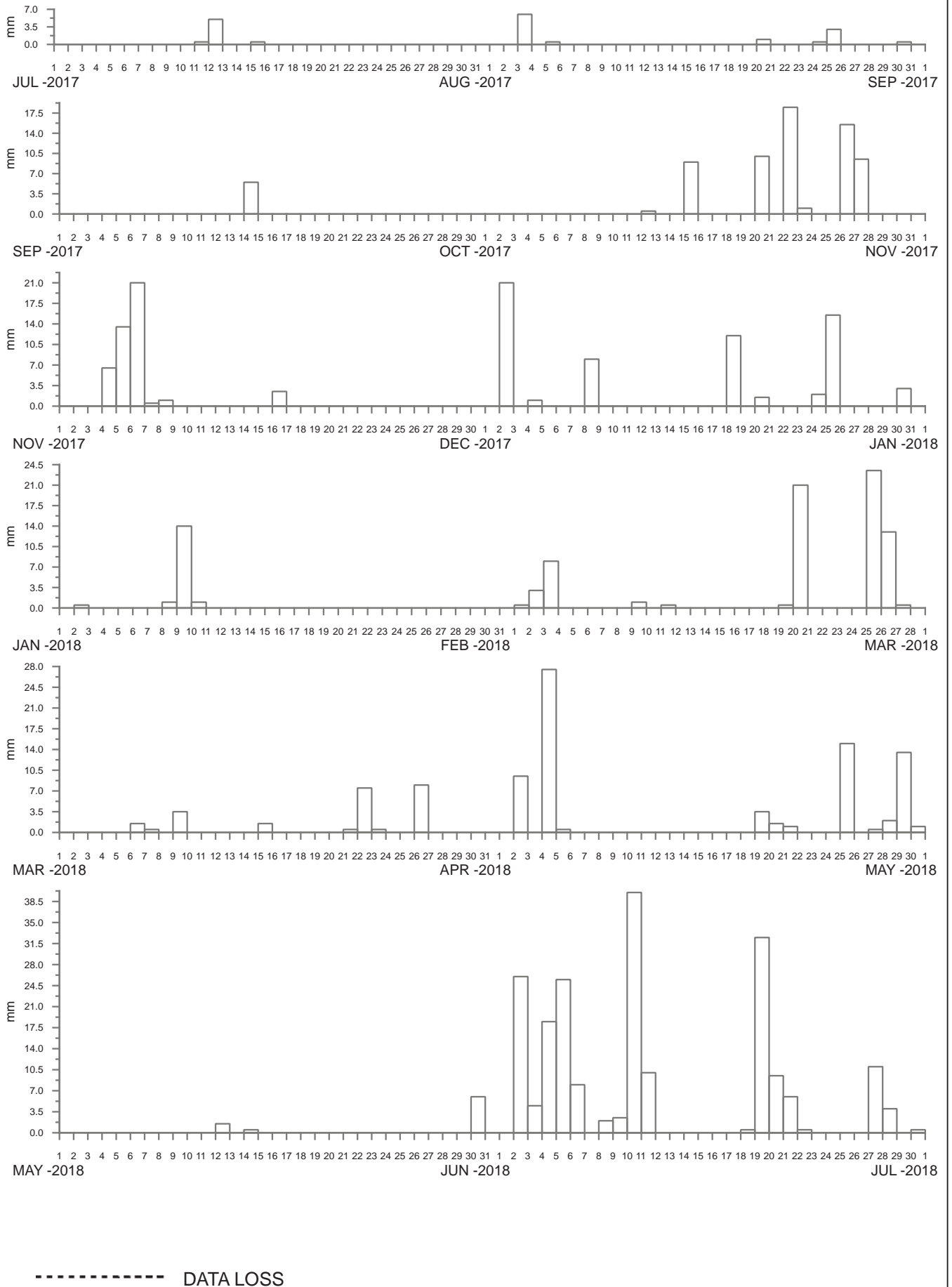
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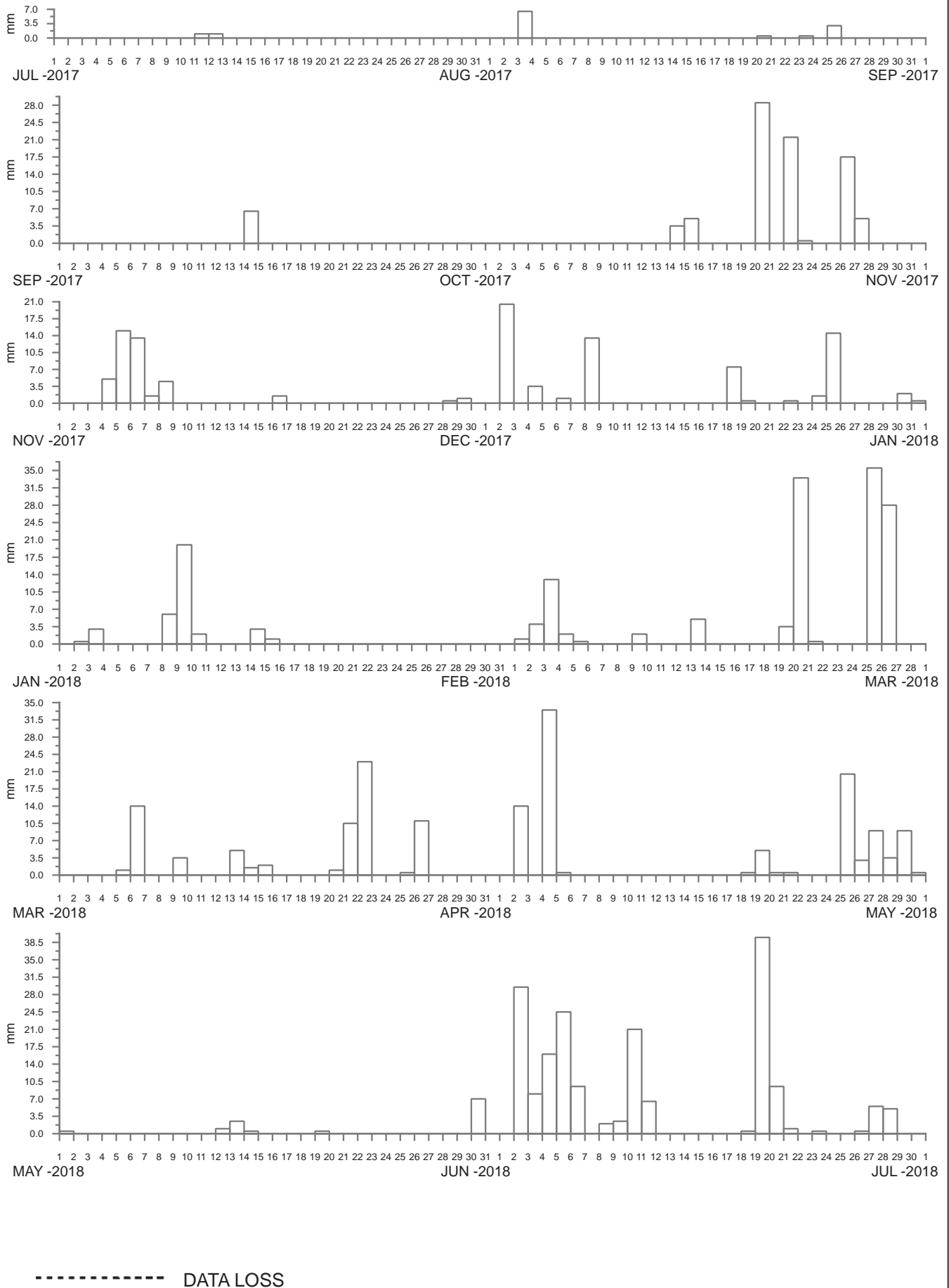


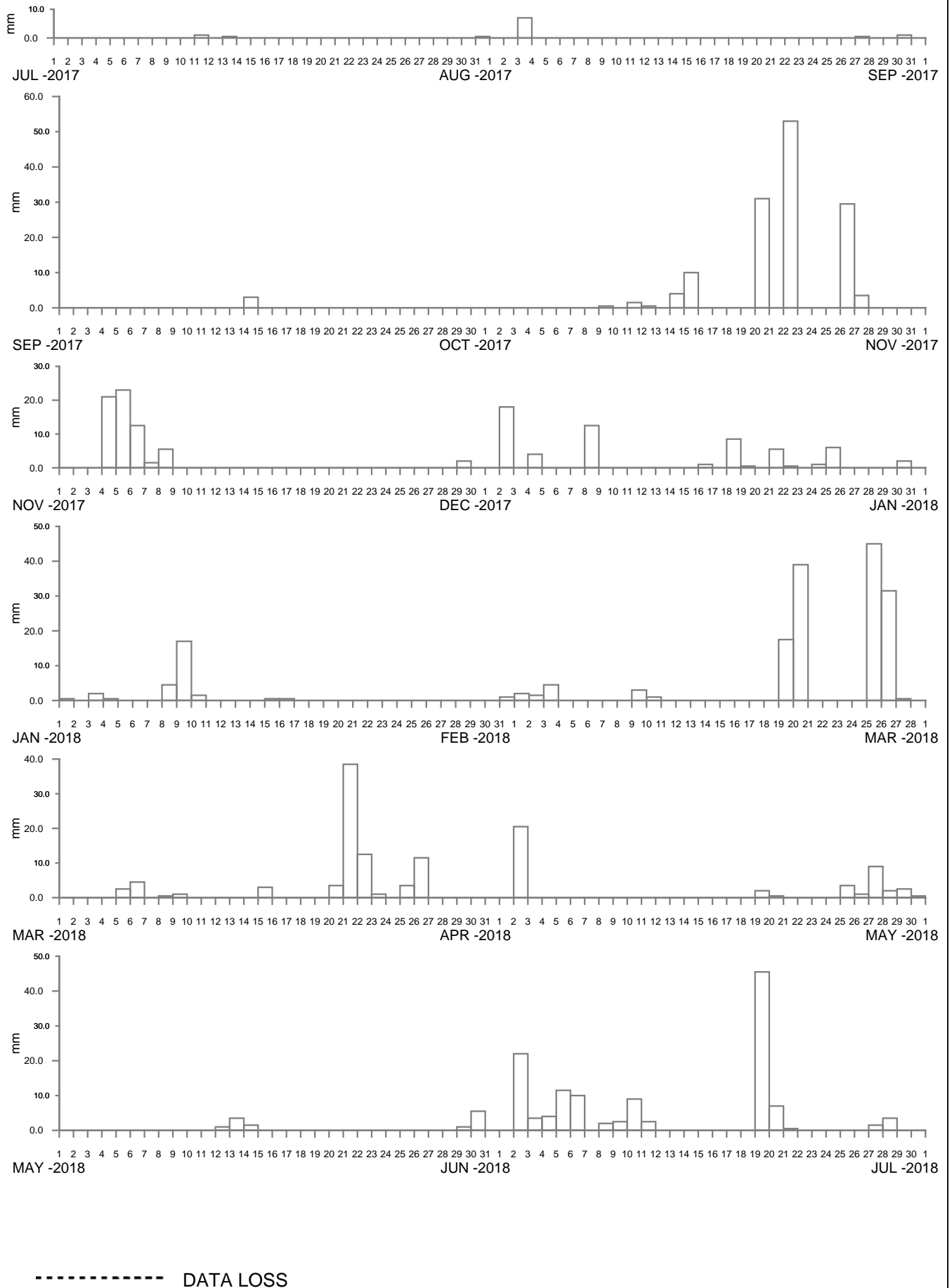


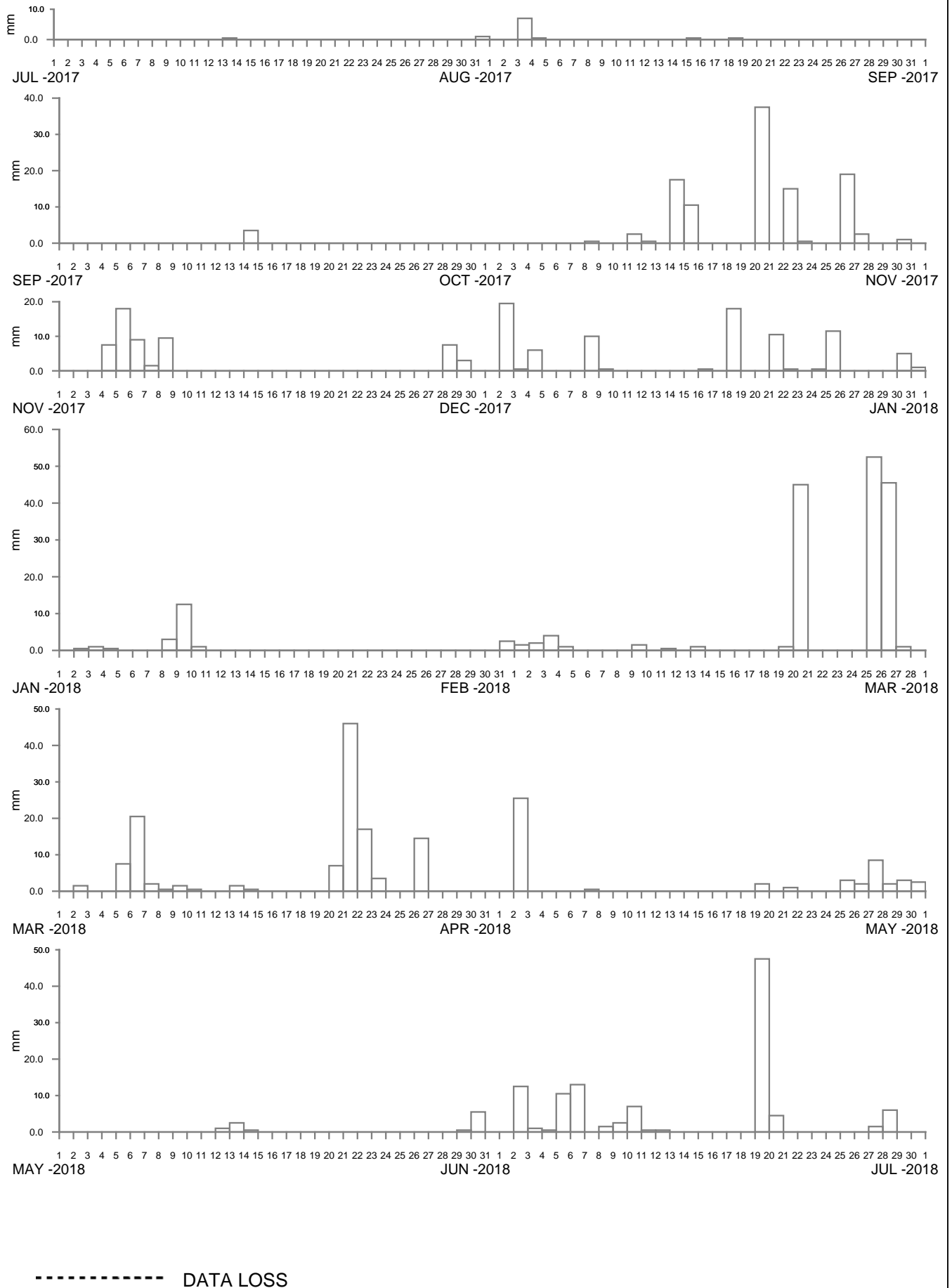


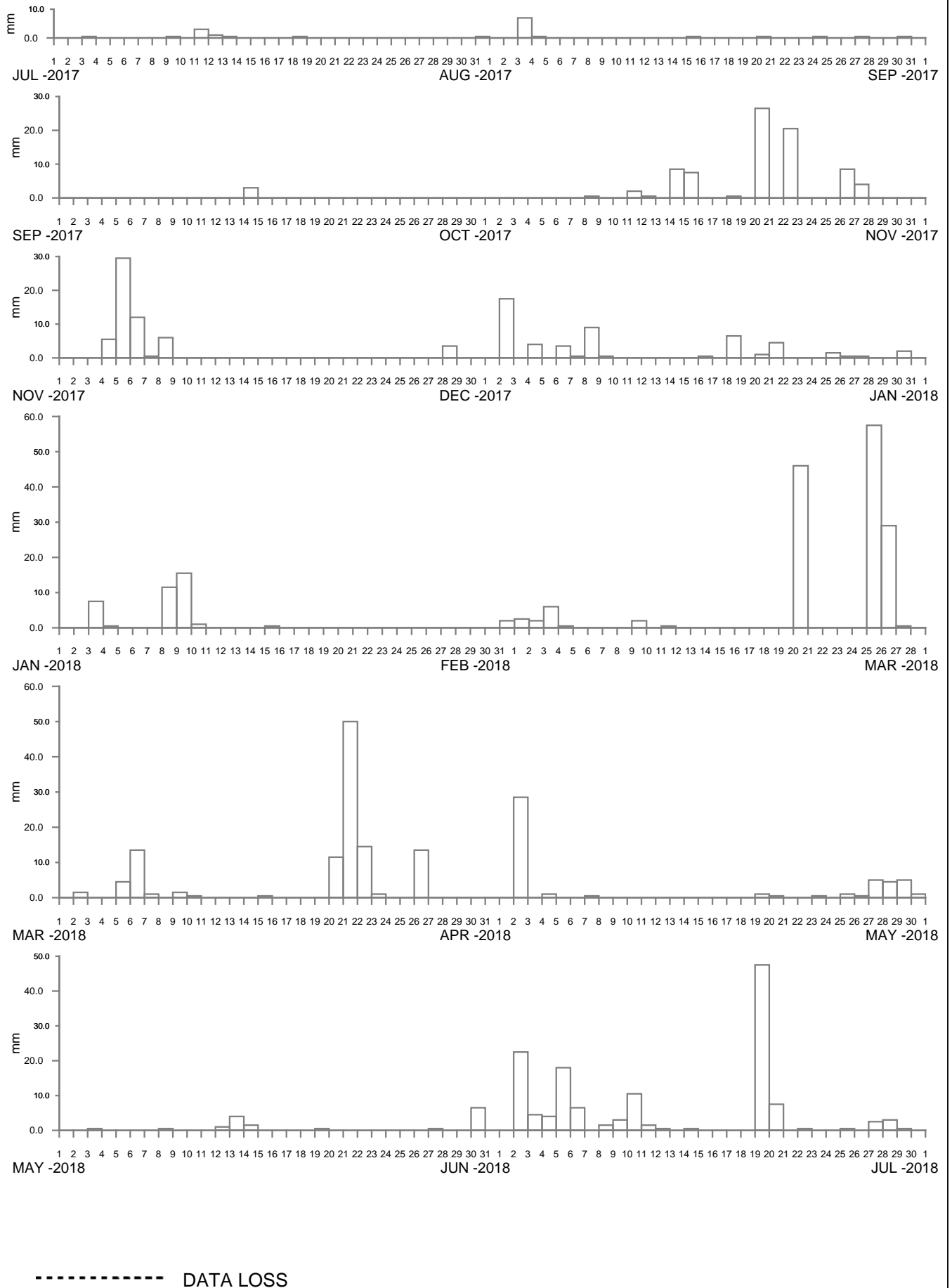
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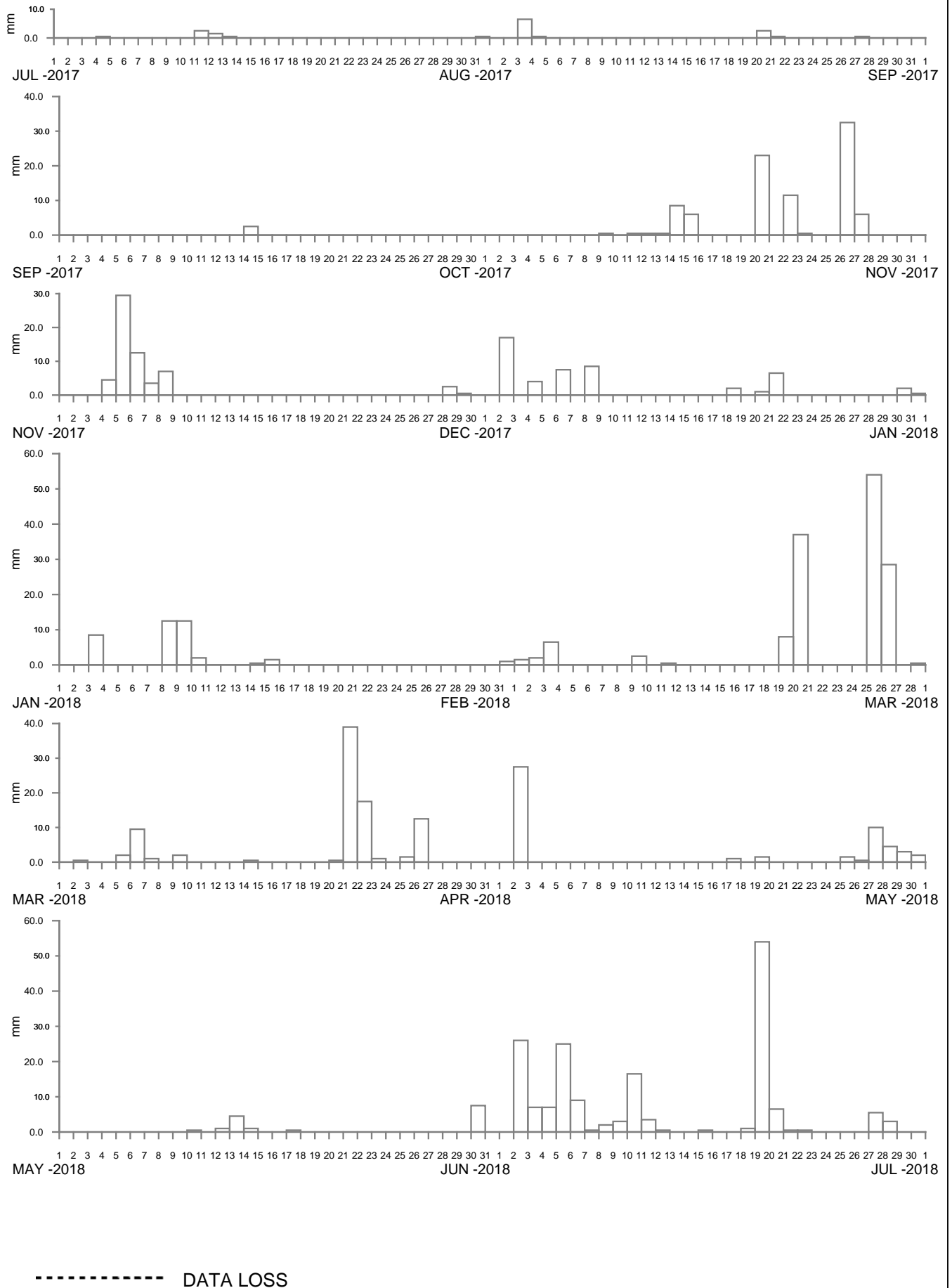


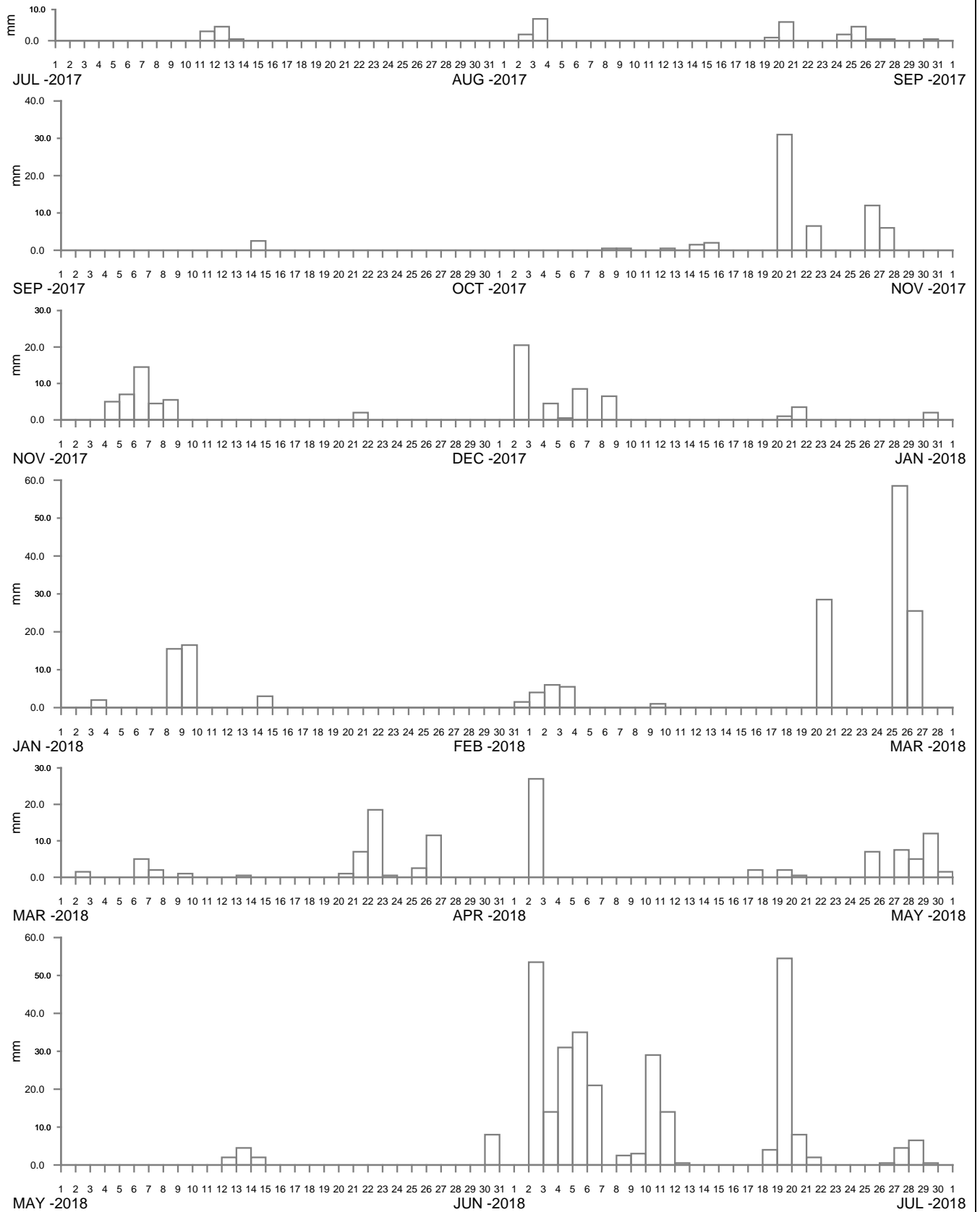




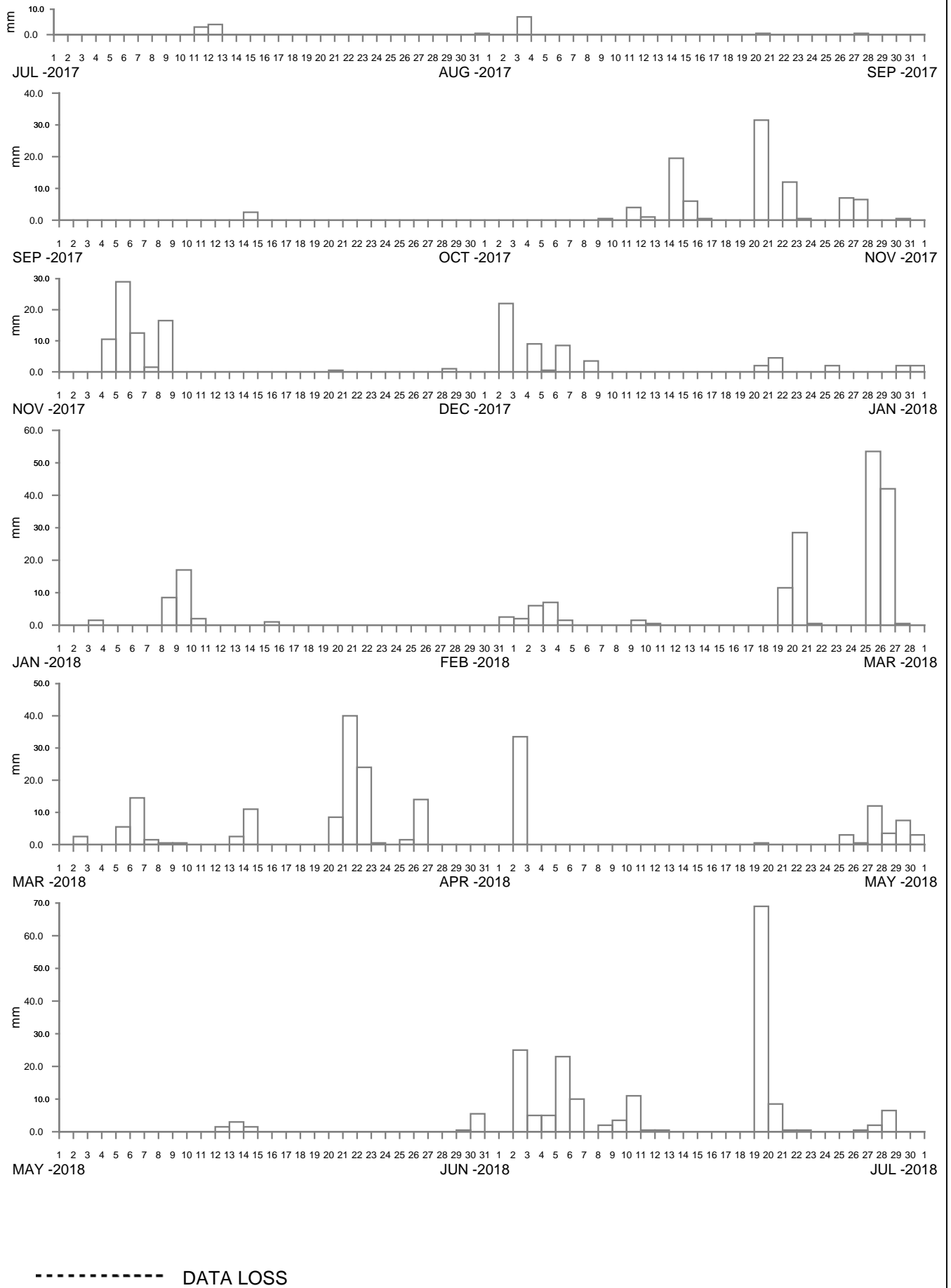


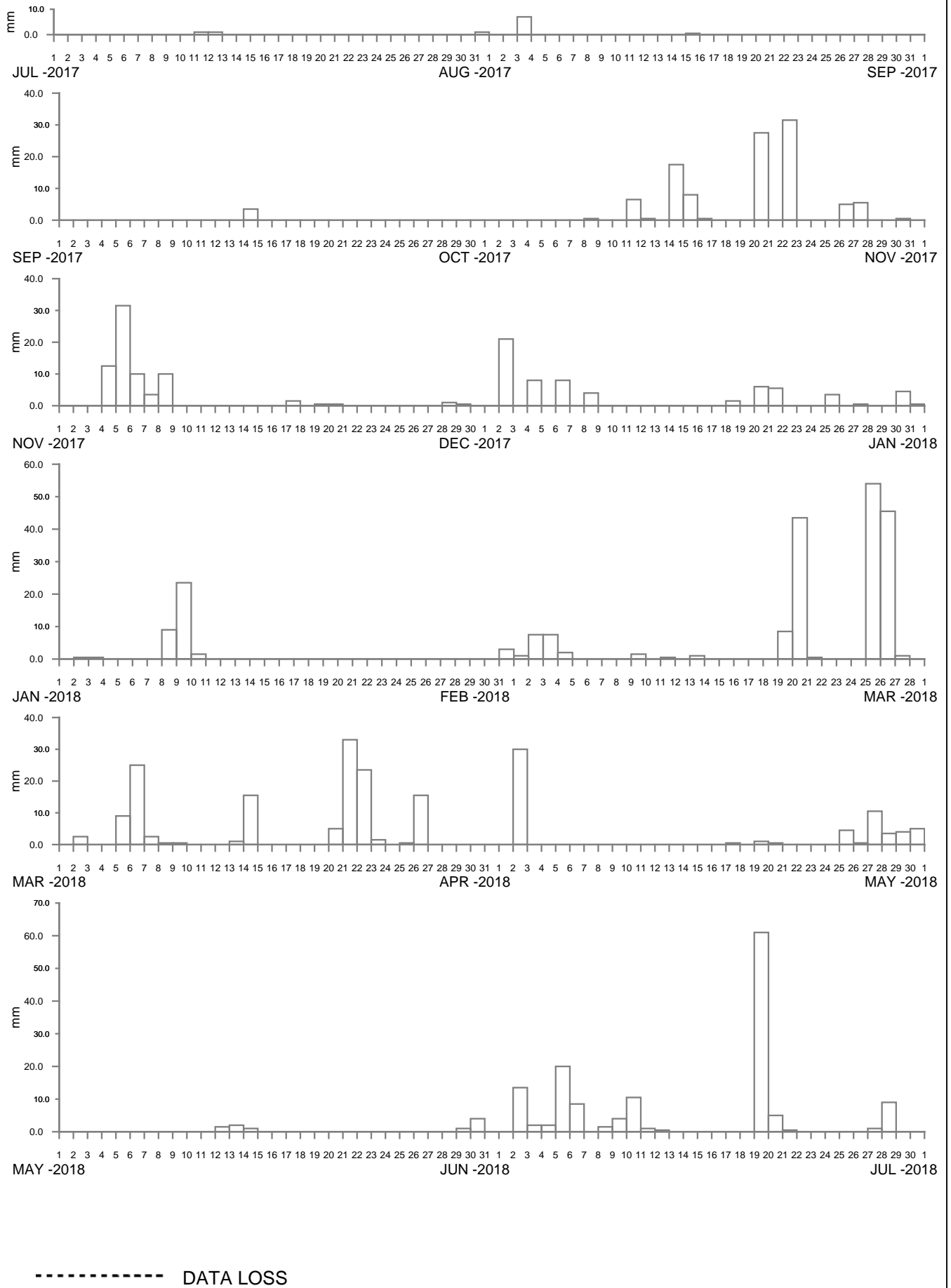


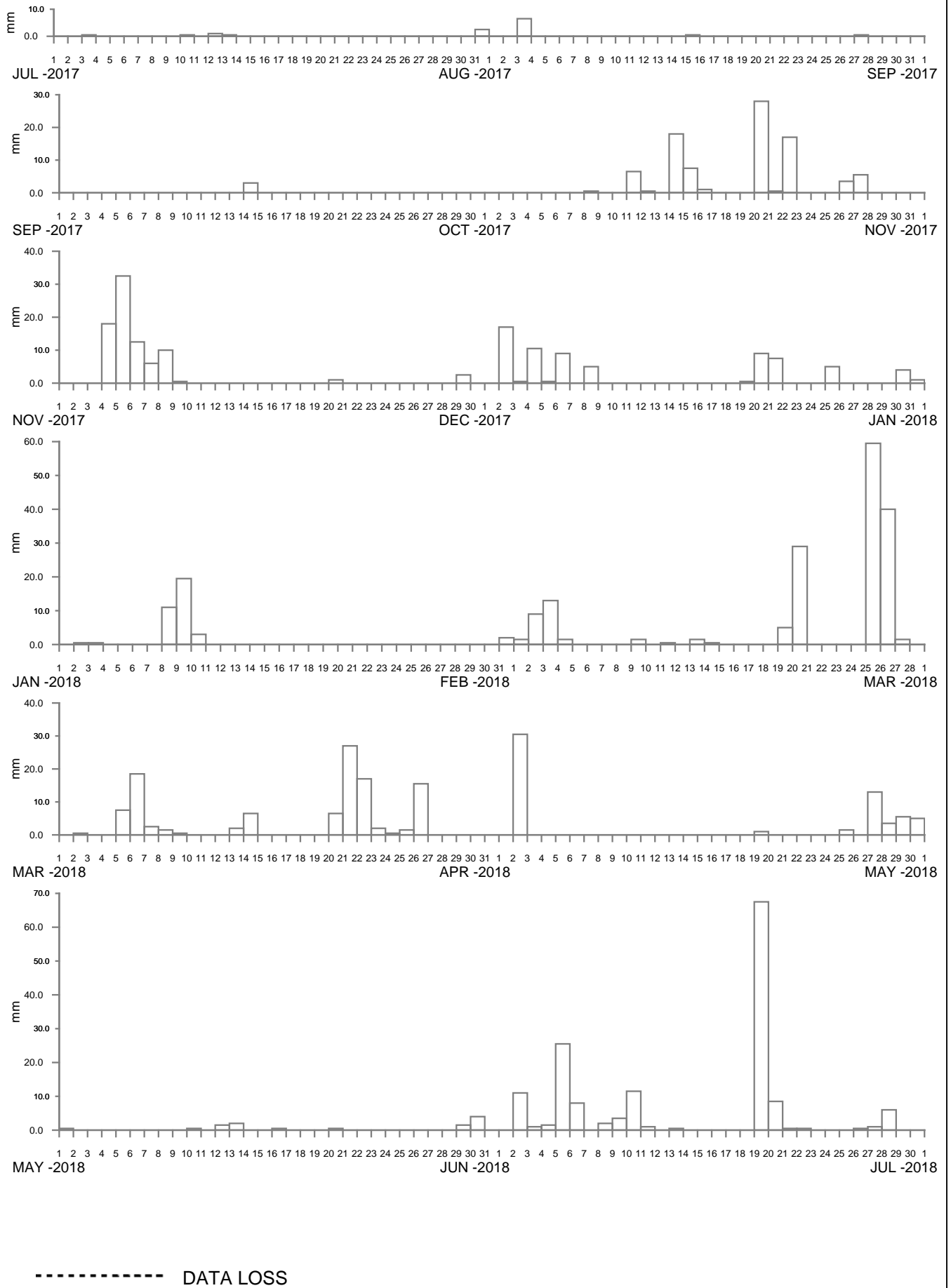


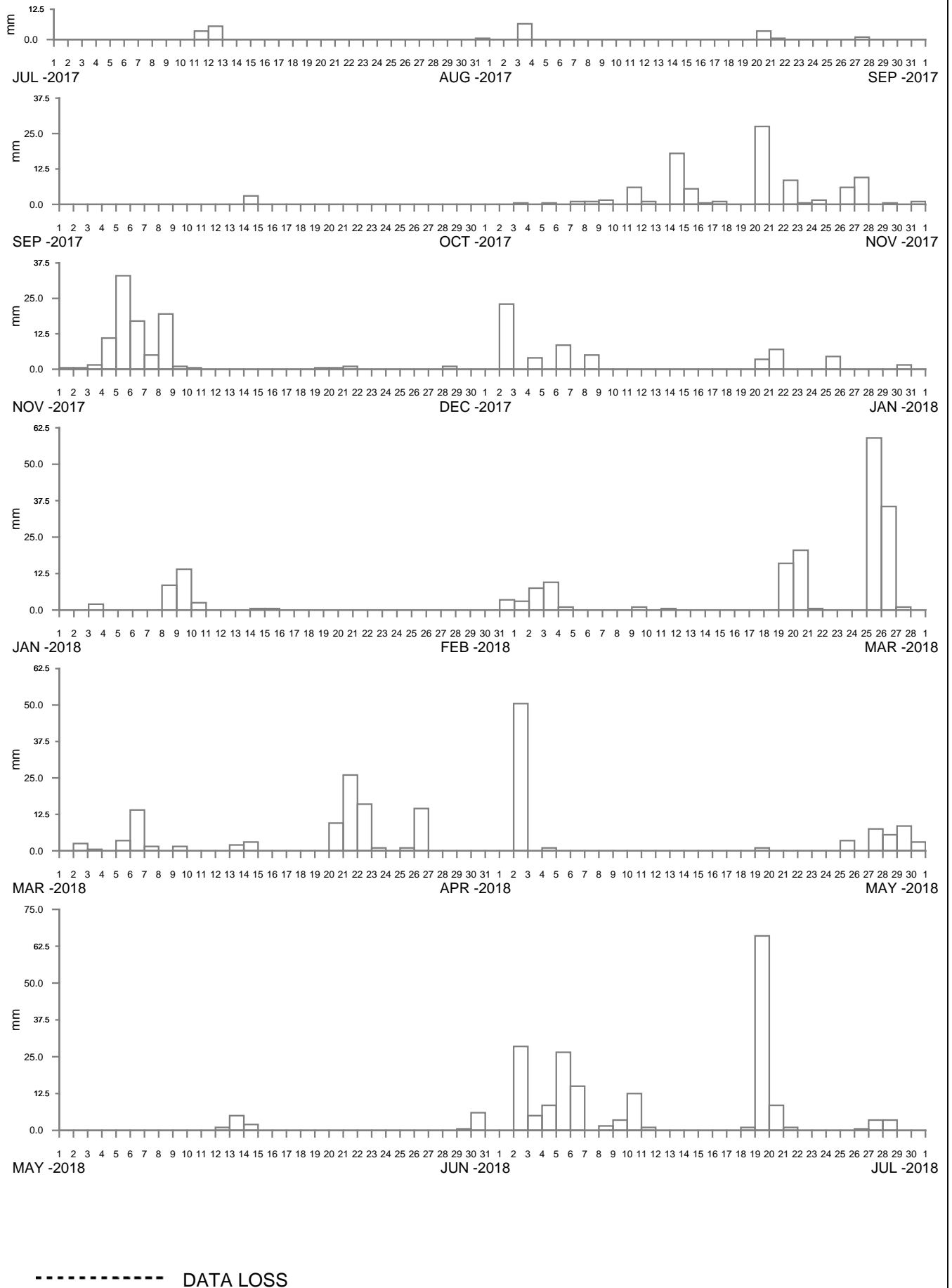


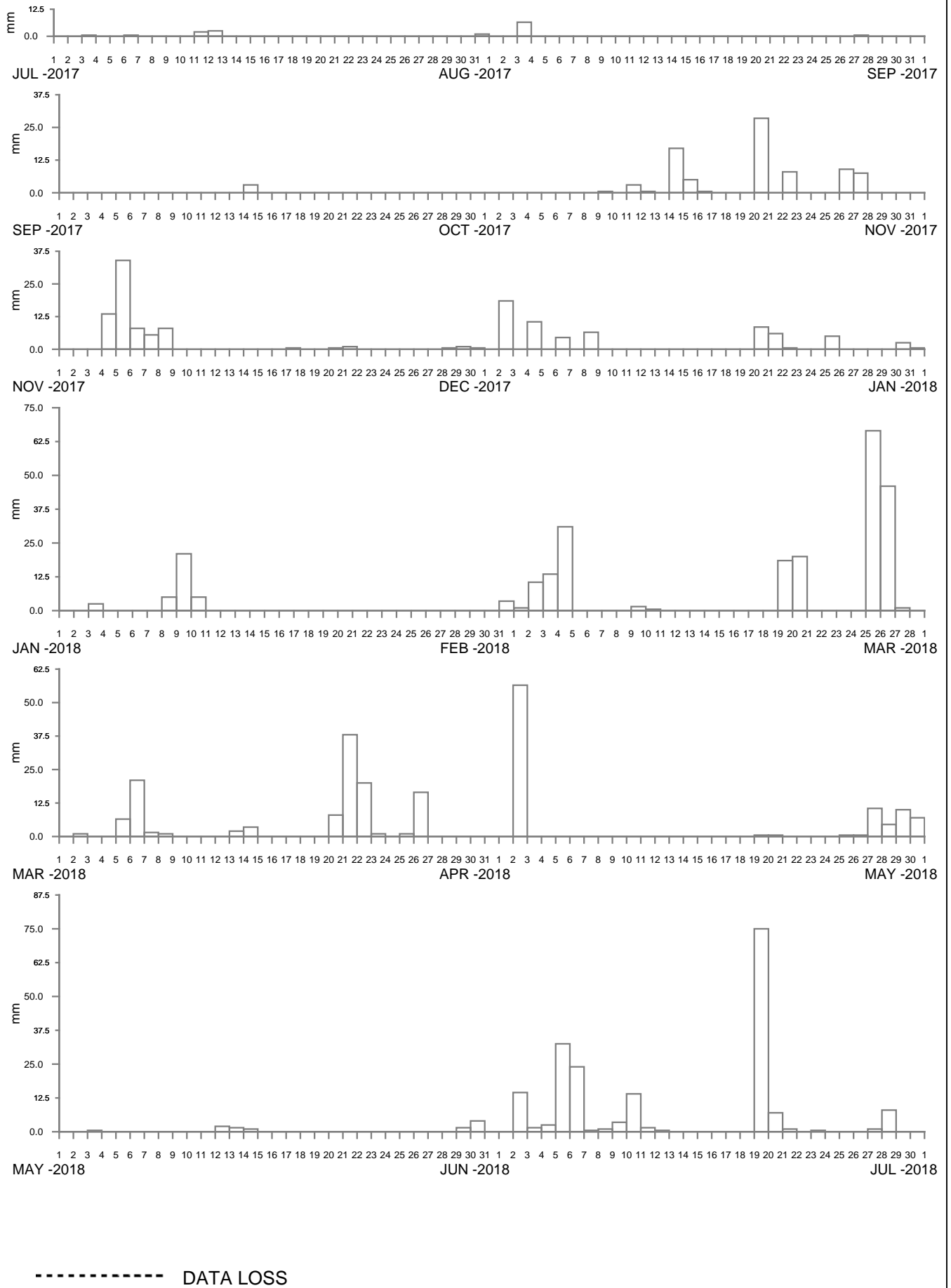
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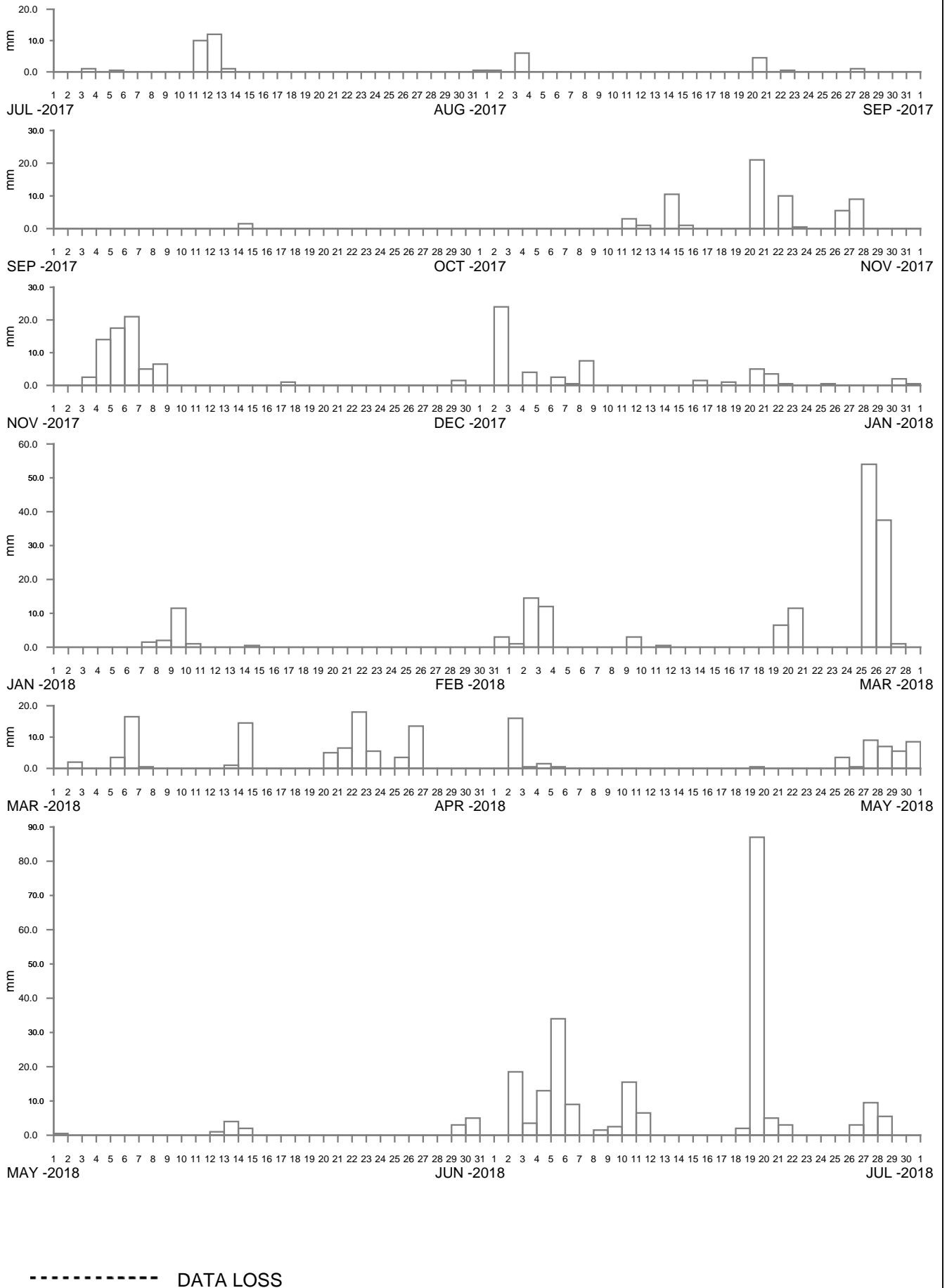


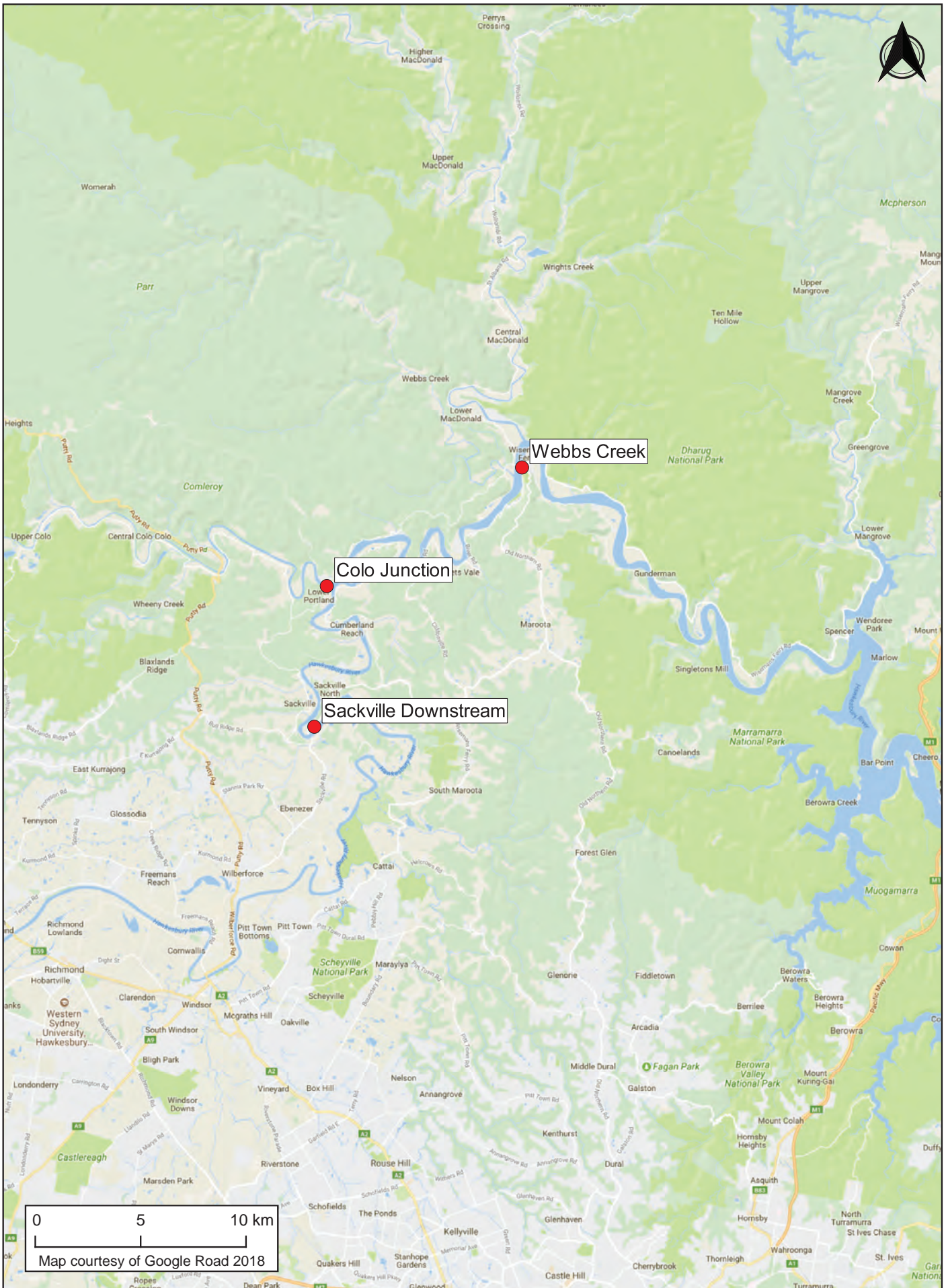


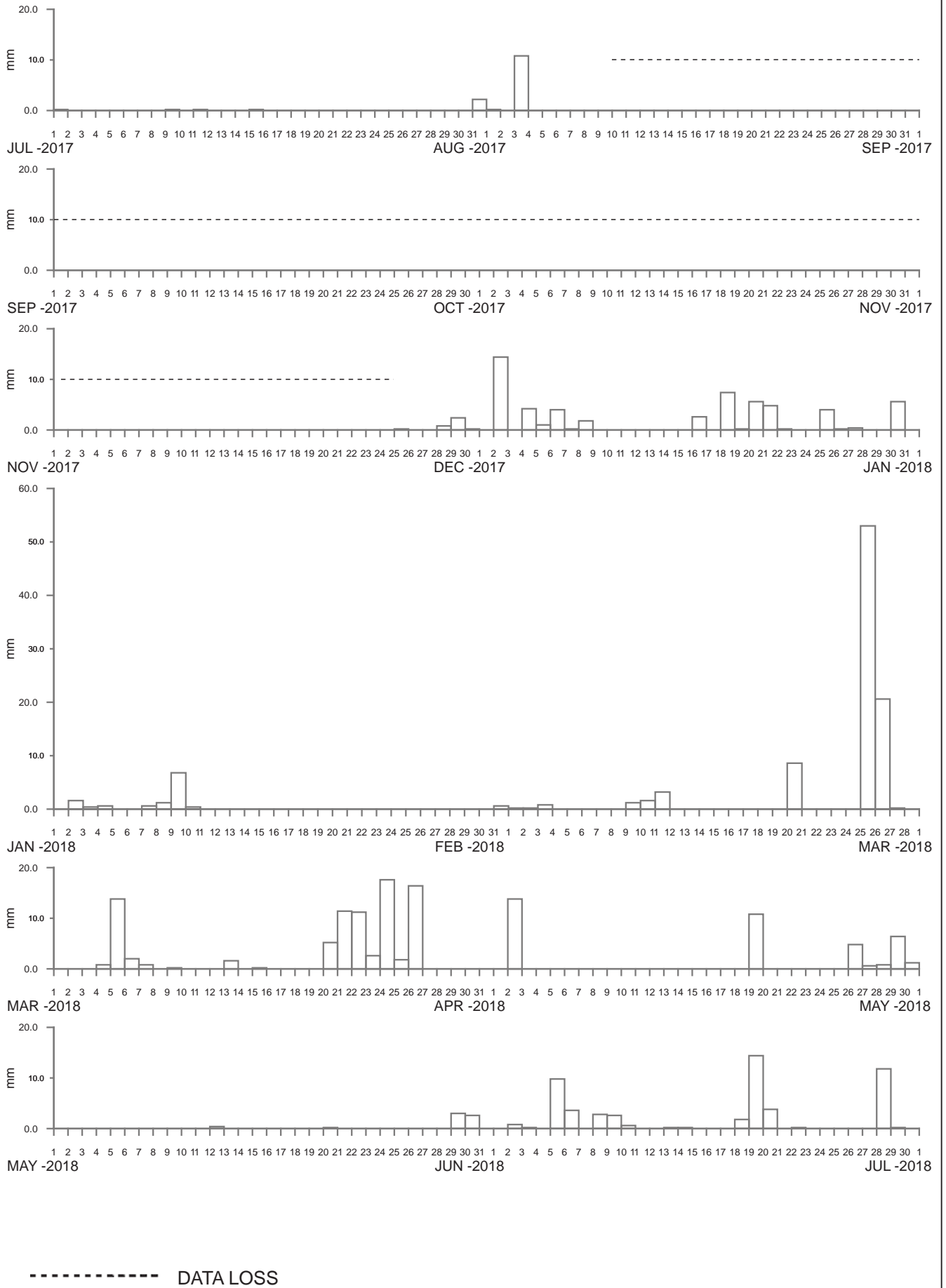


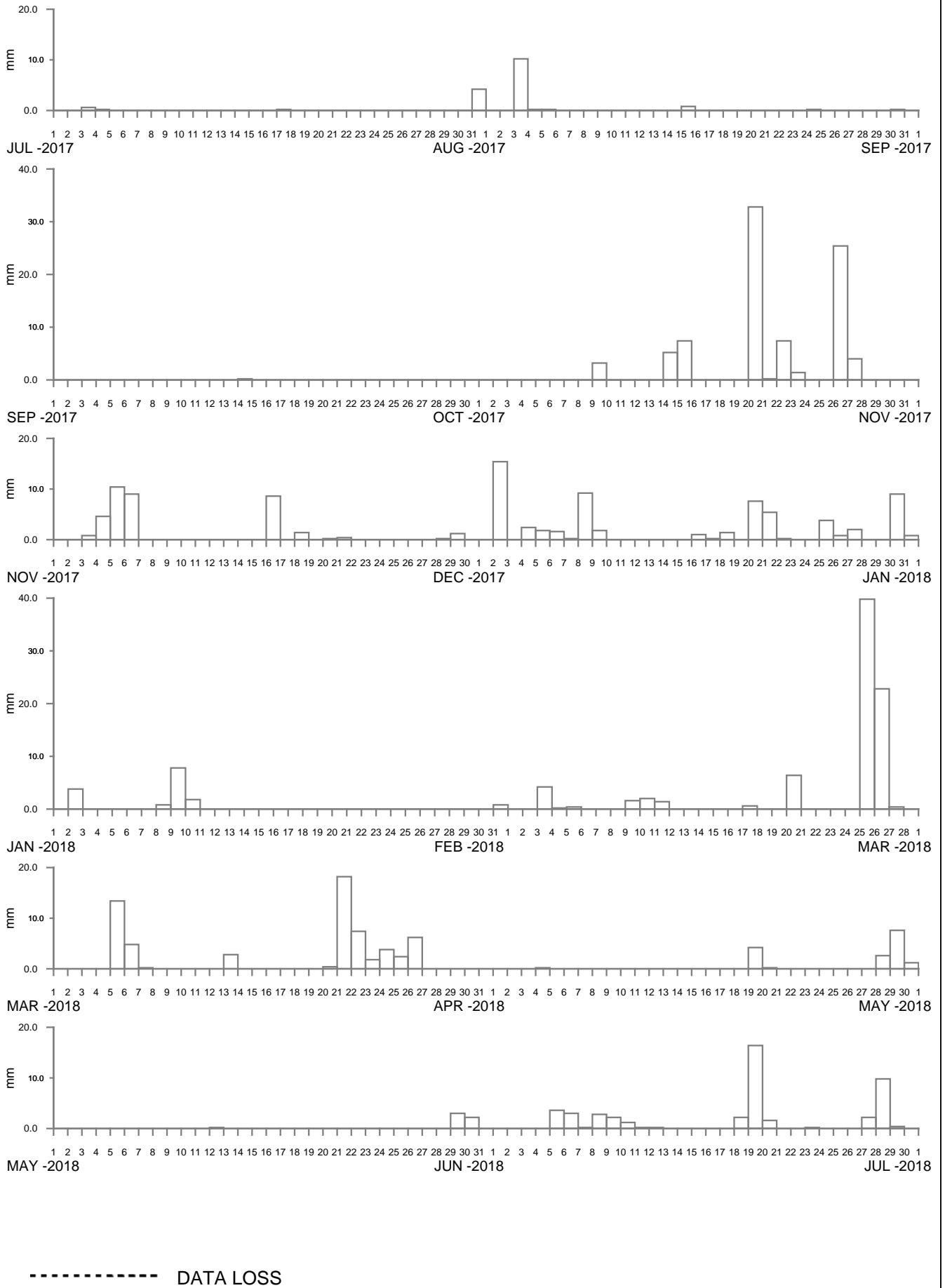


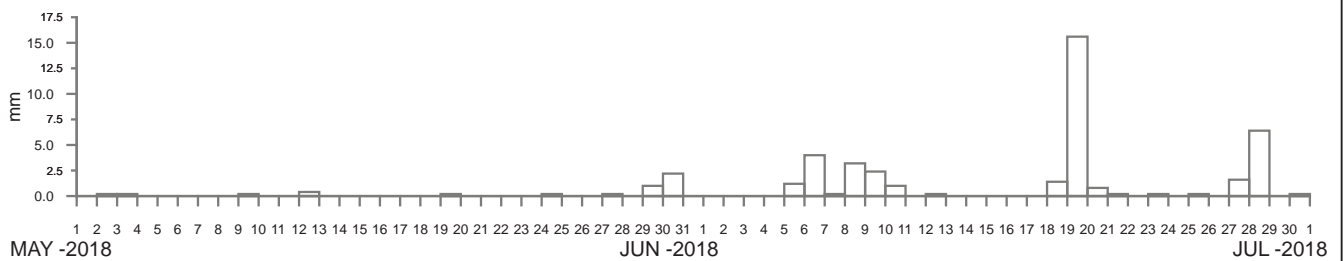
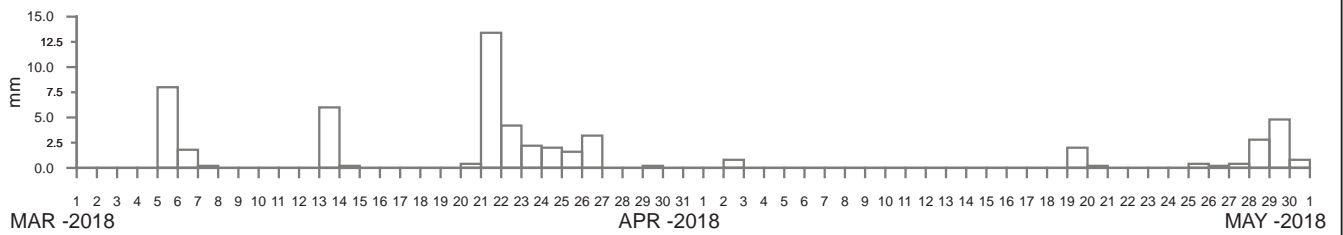
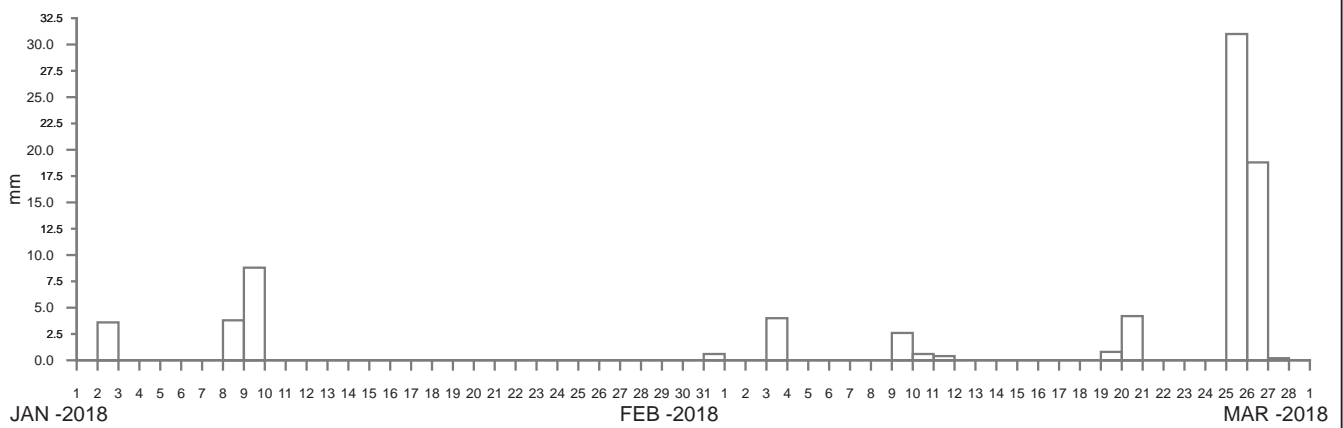
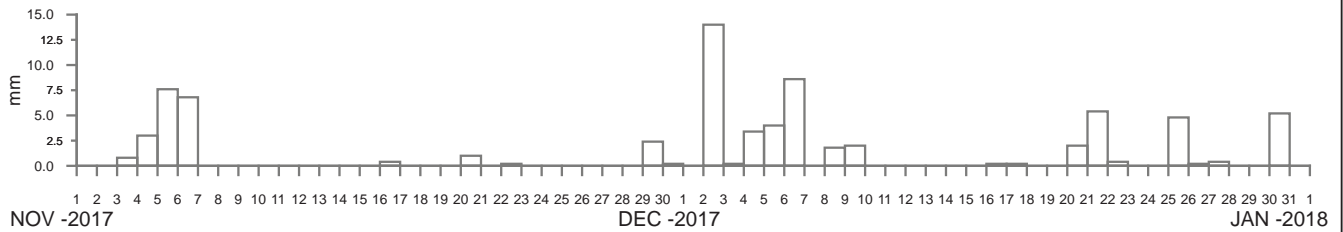
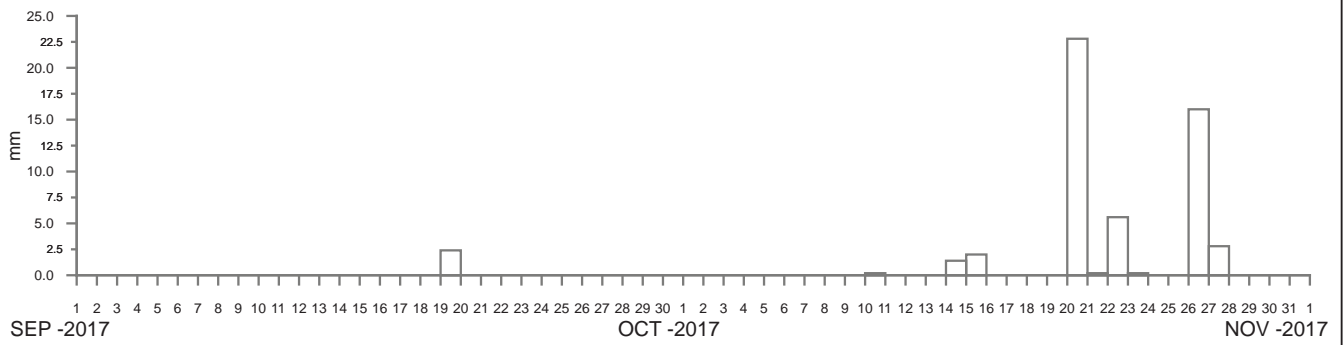
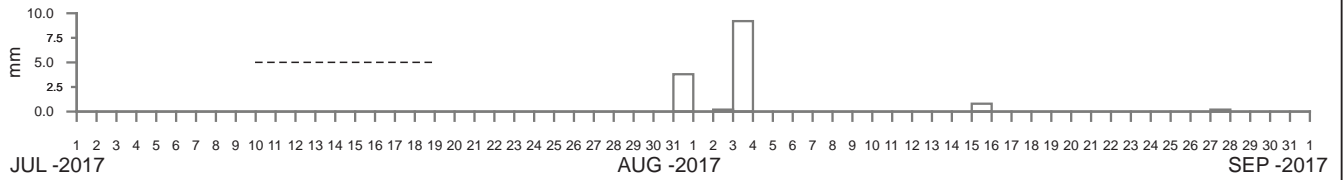




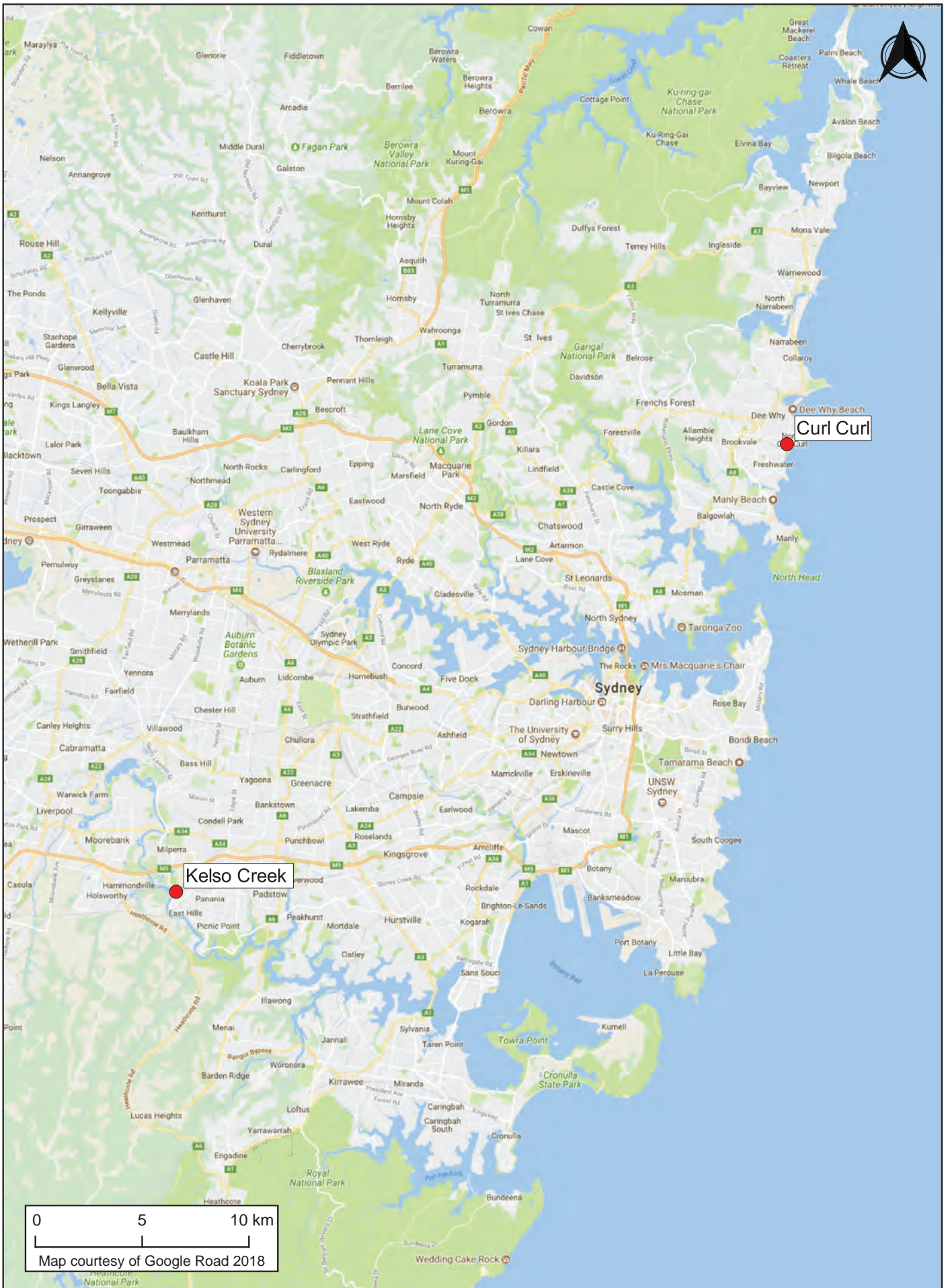




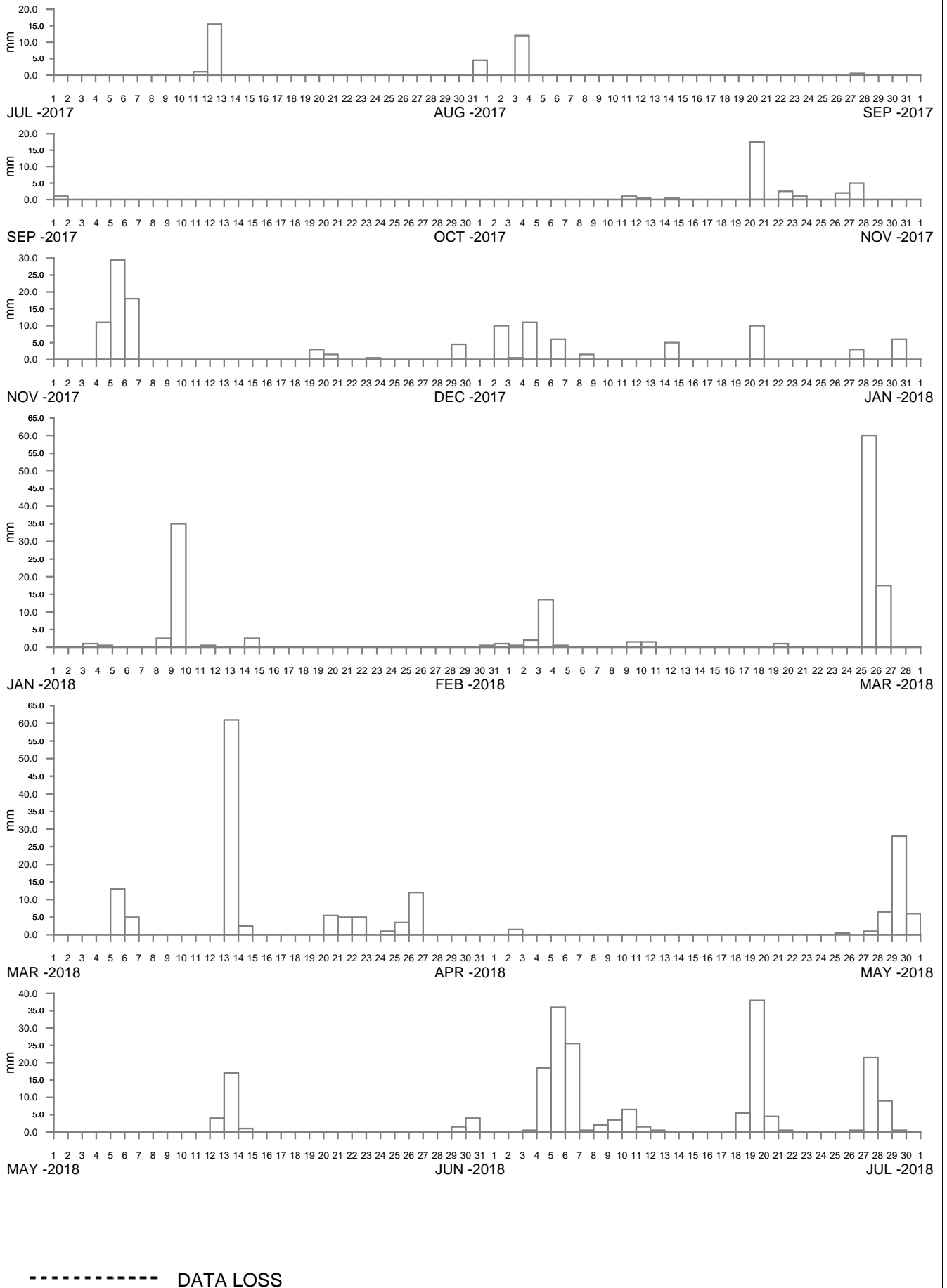


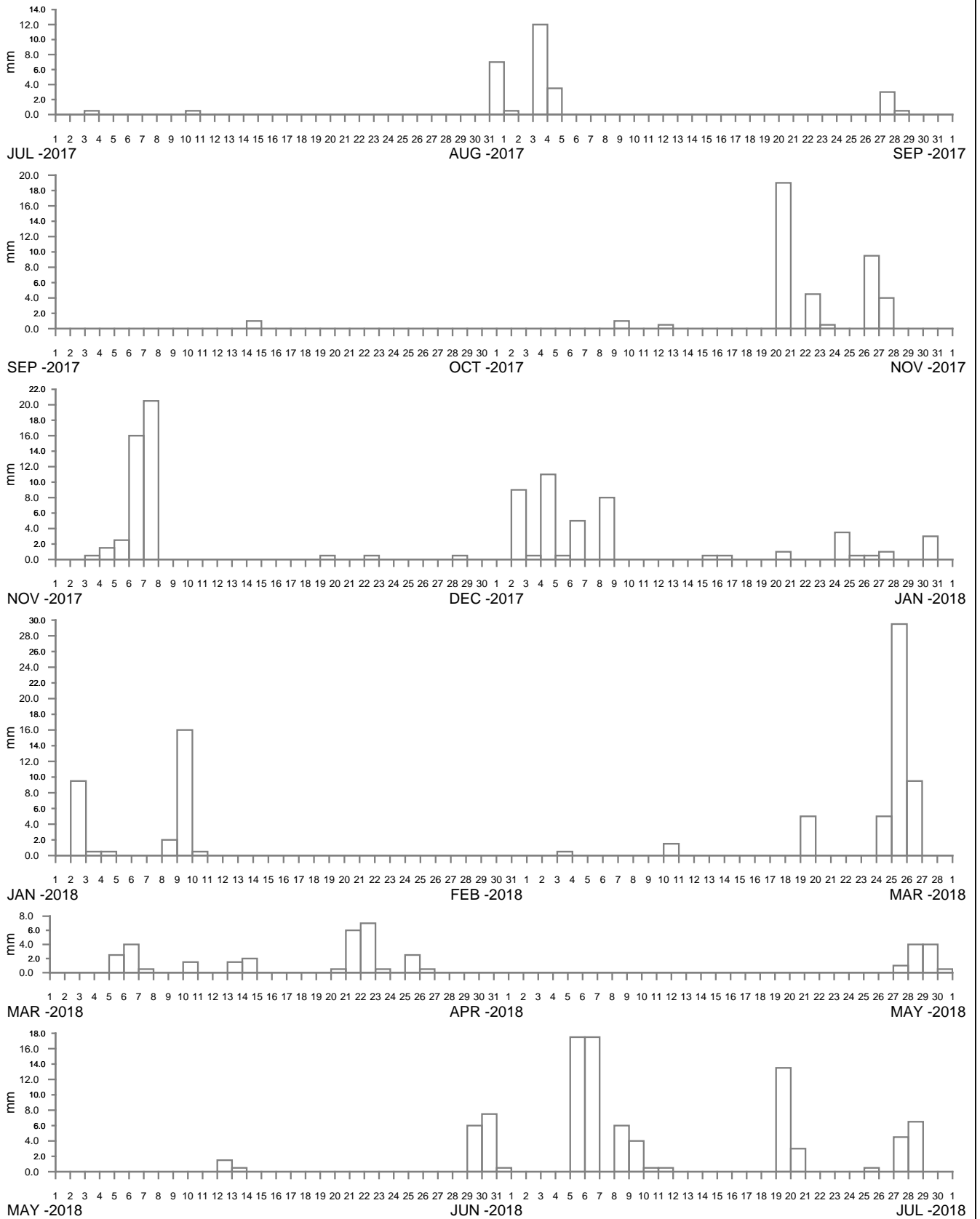


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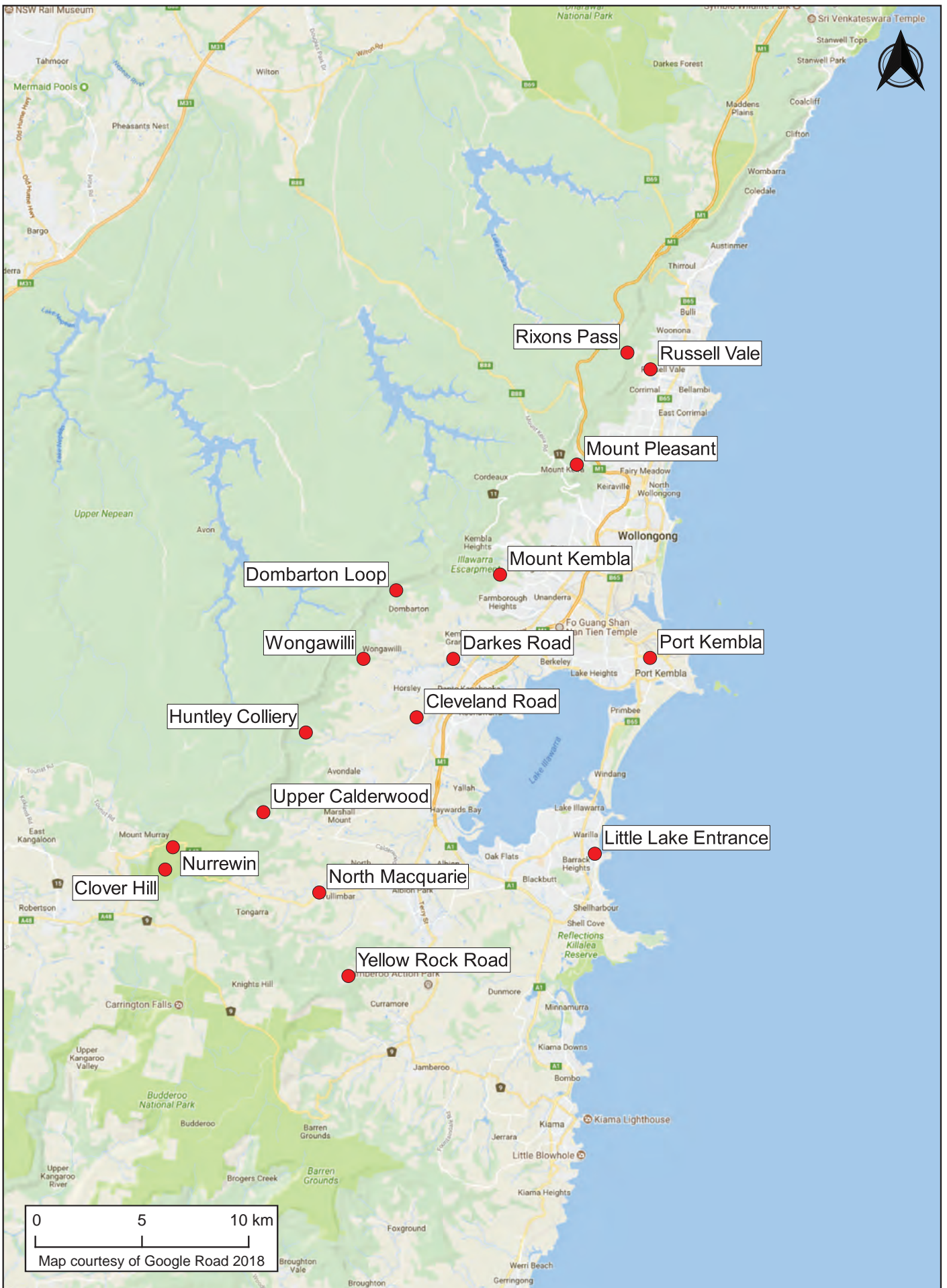


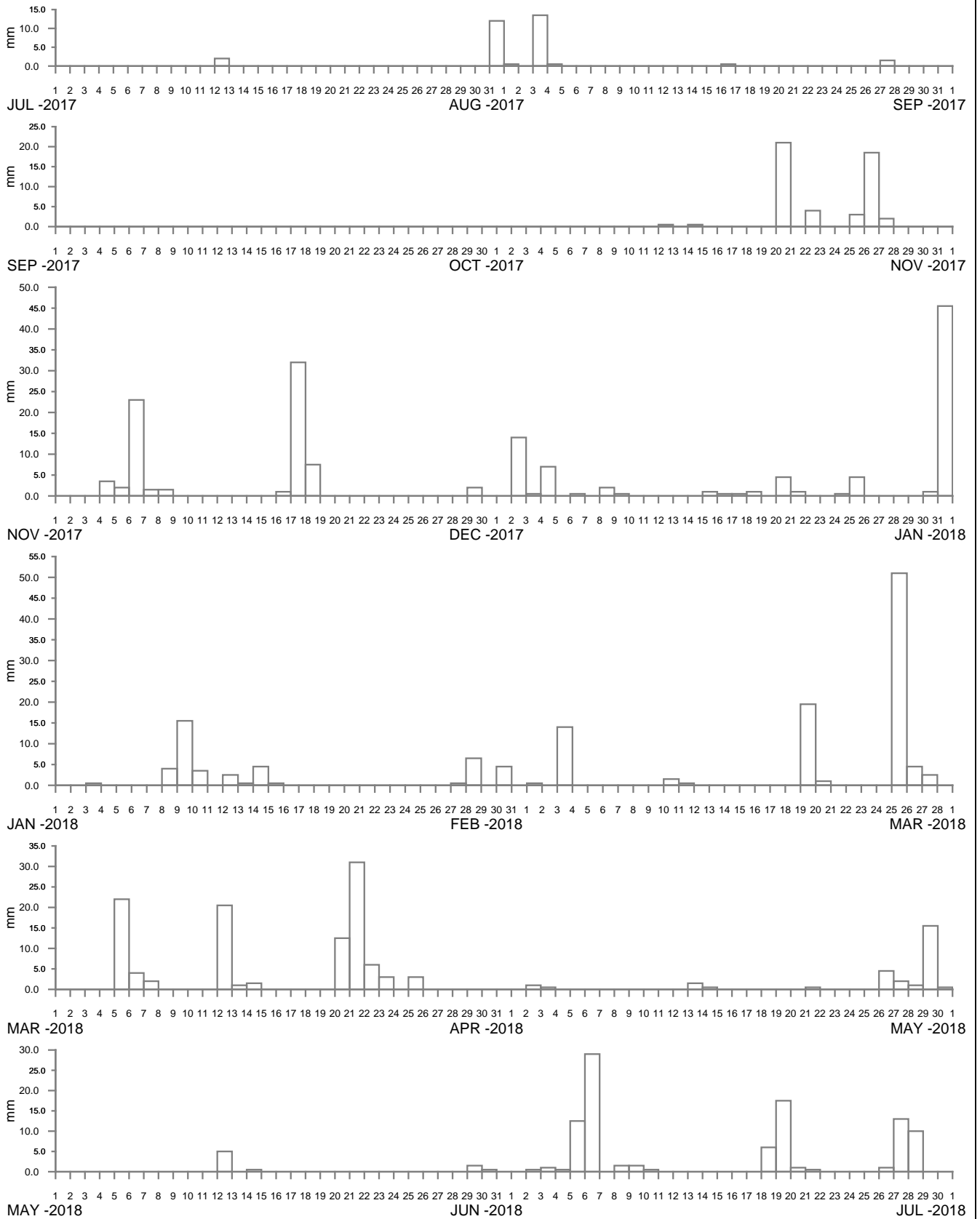
0 5 10 km
Map courtesy of Google Road 2018

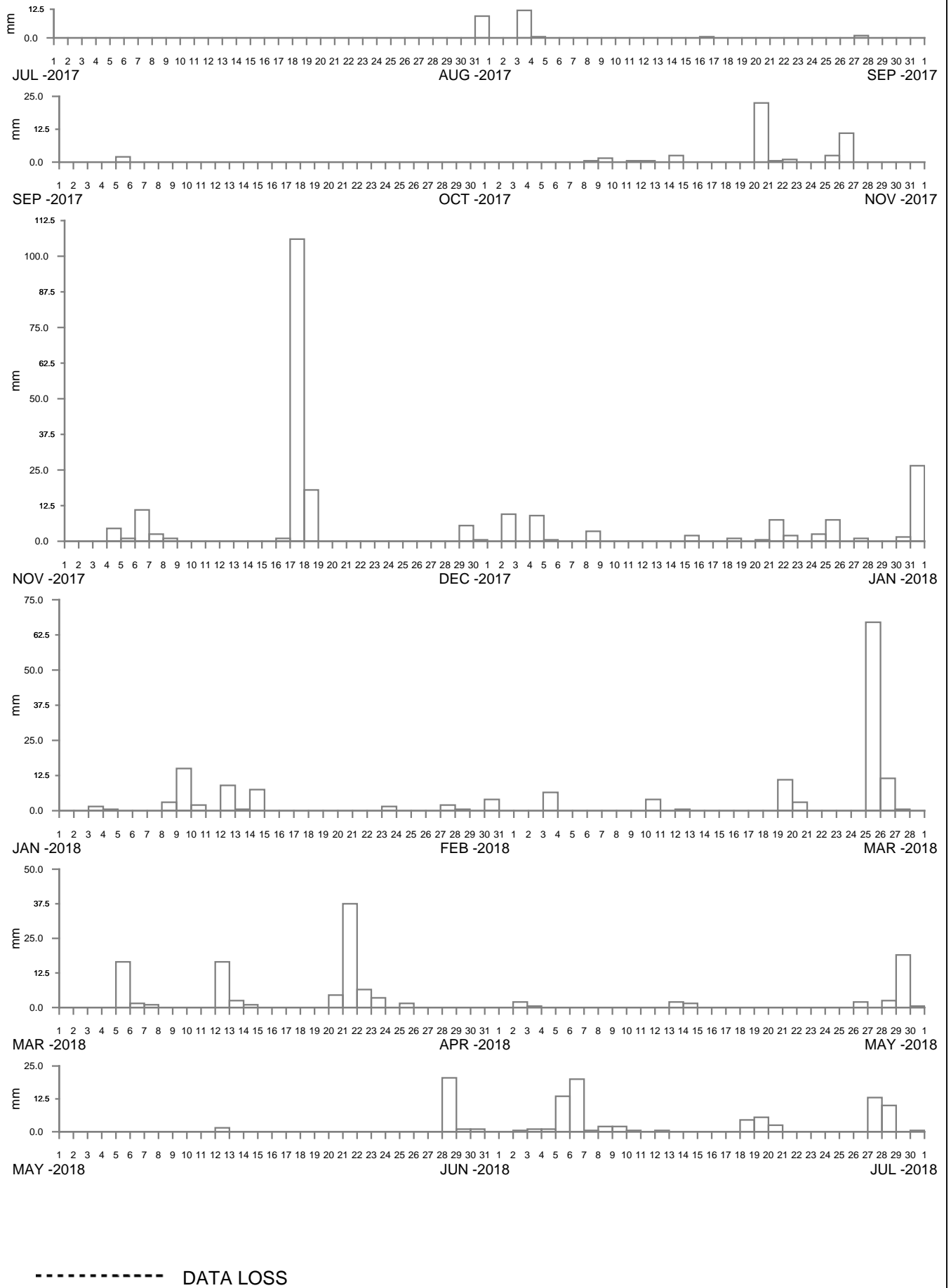


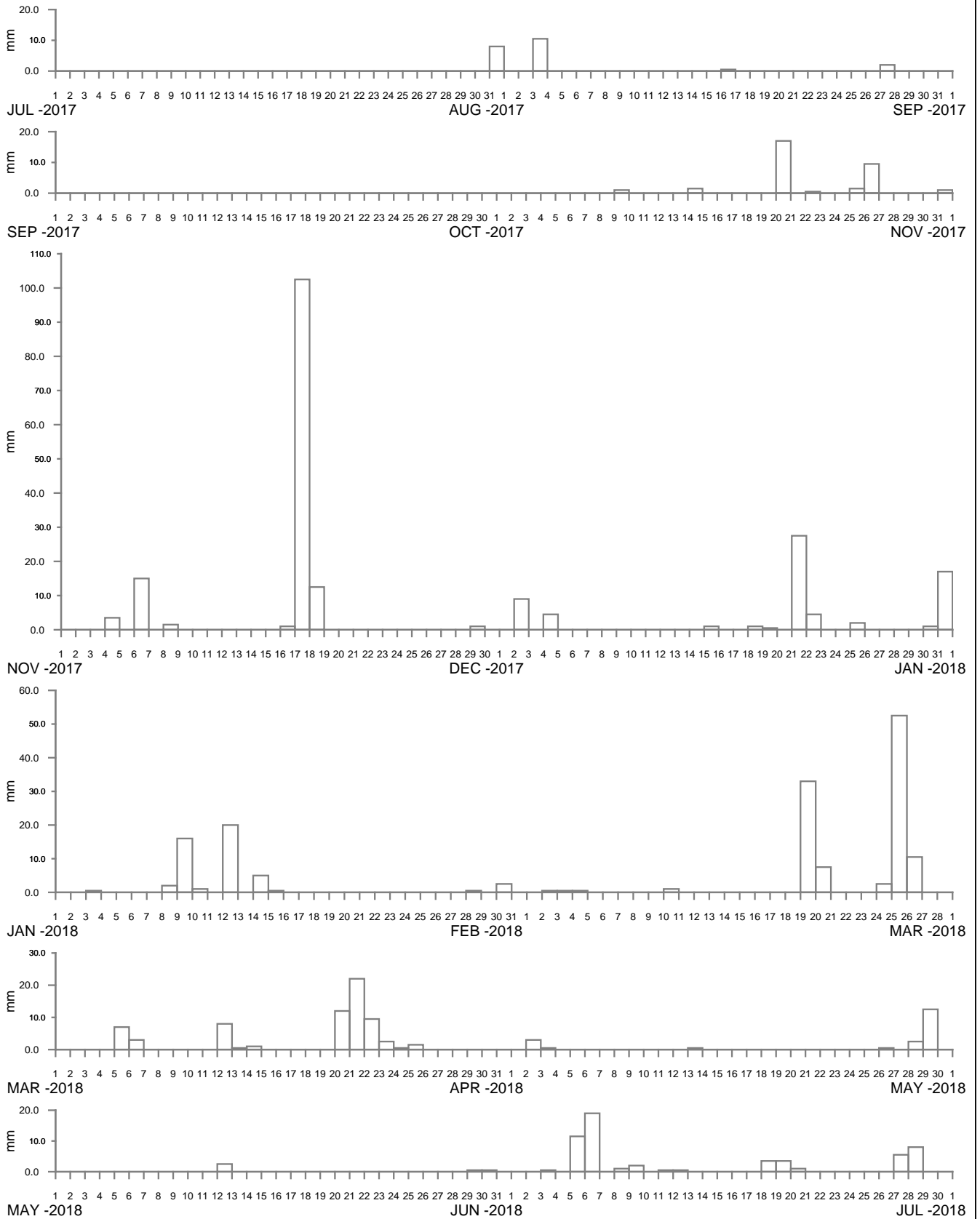


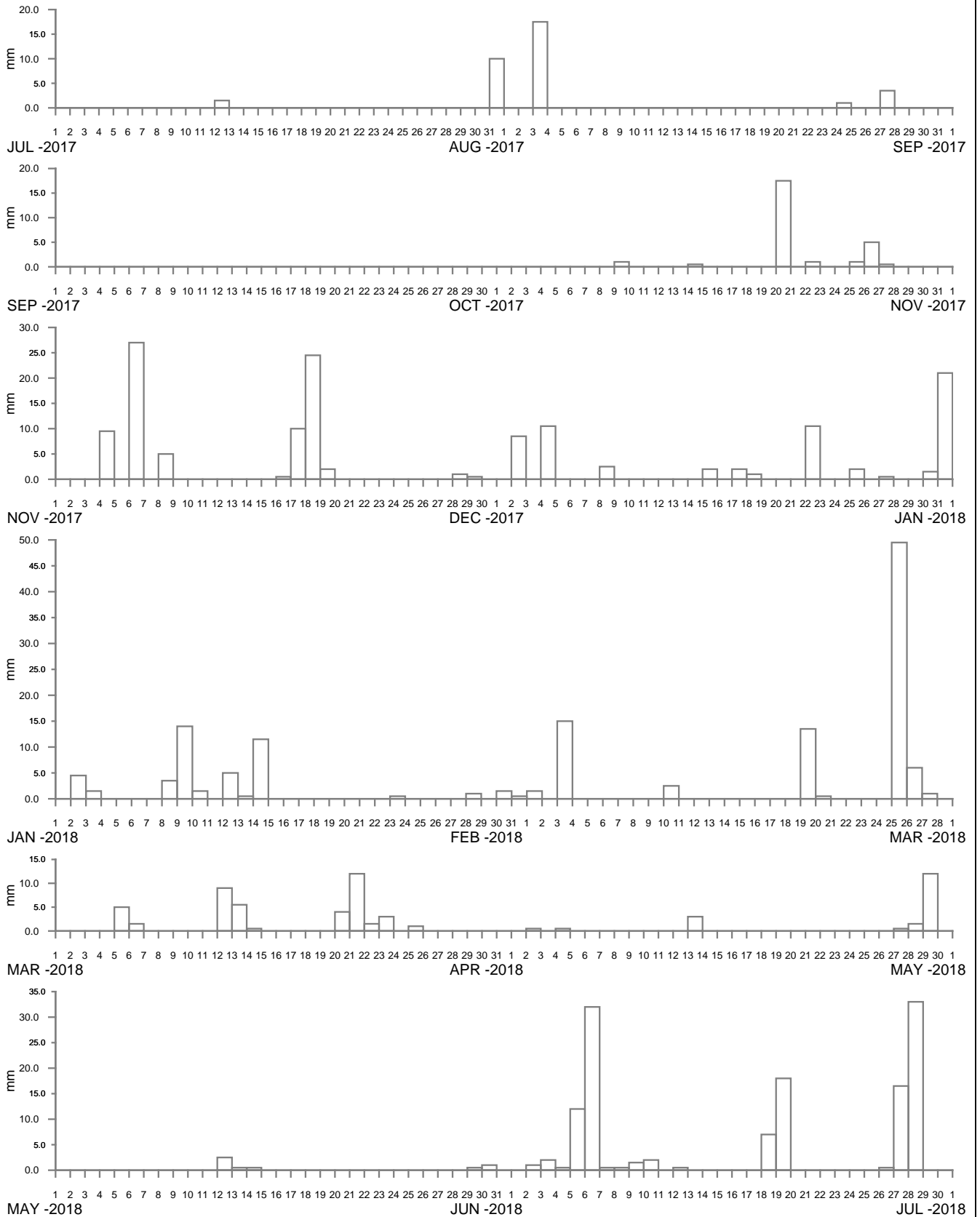
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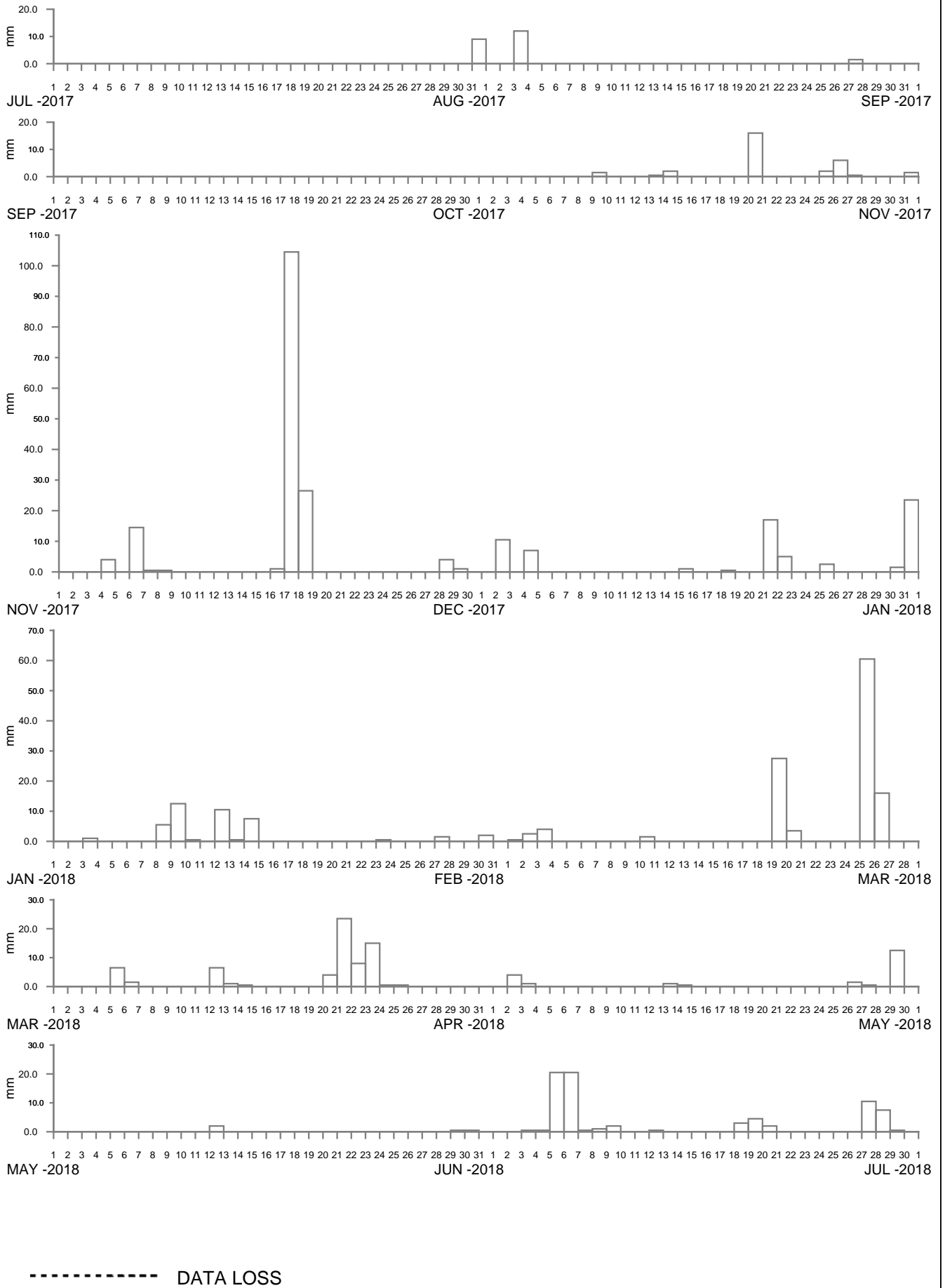


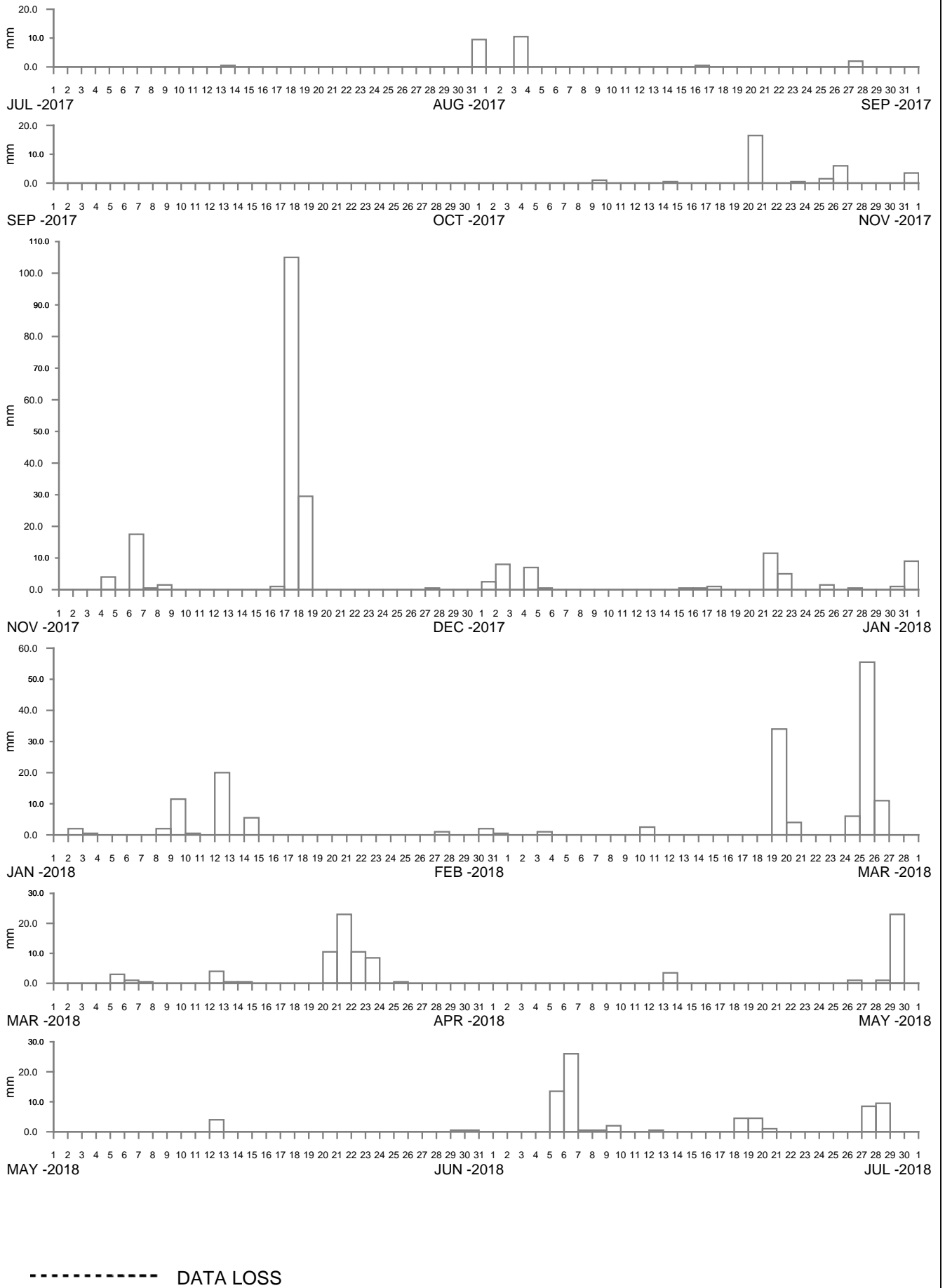


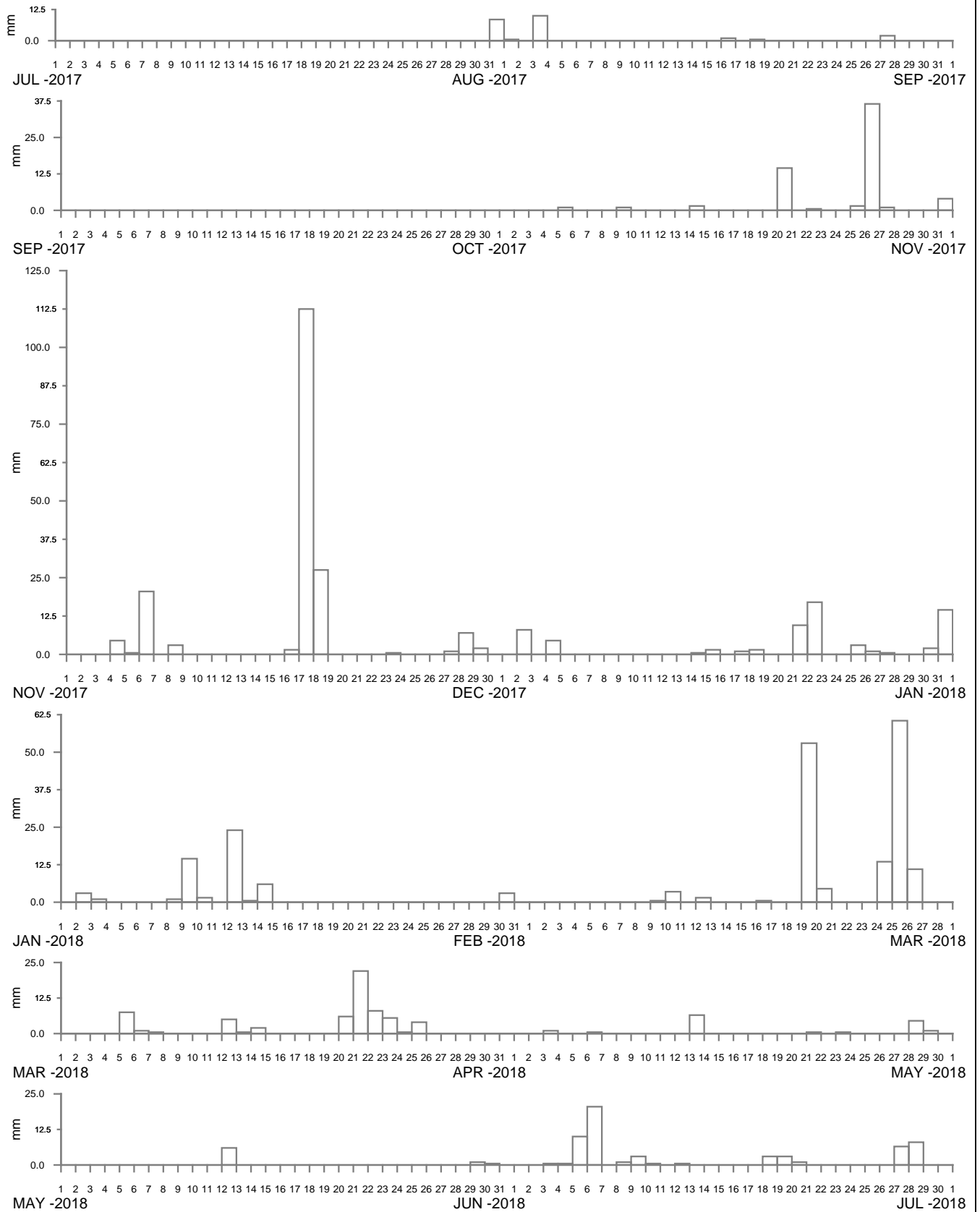


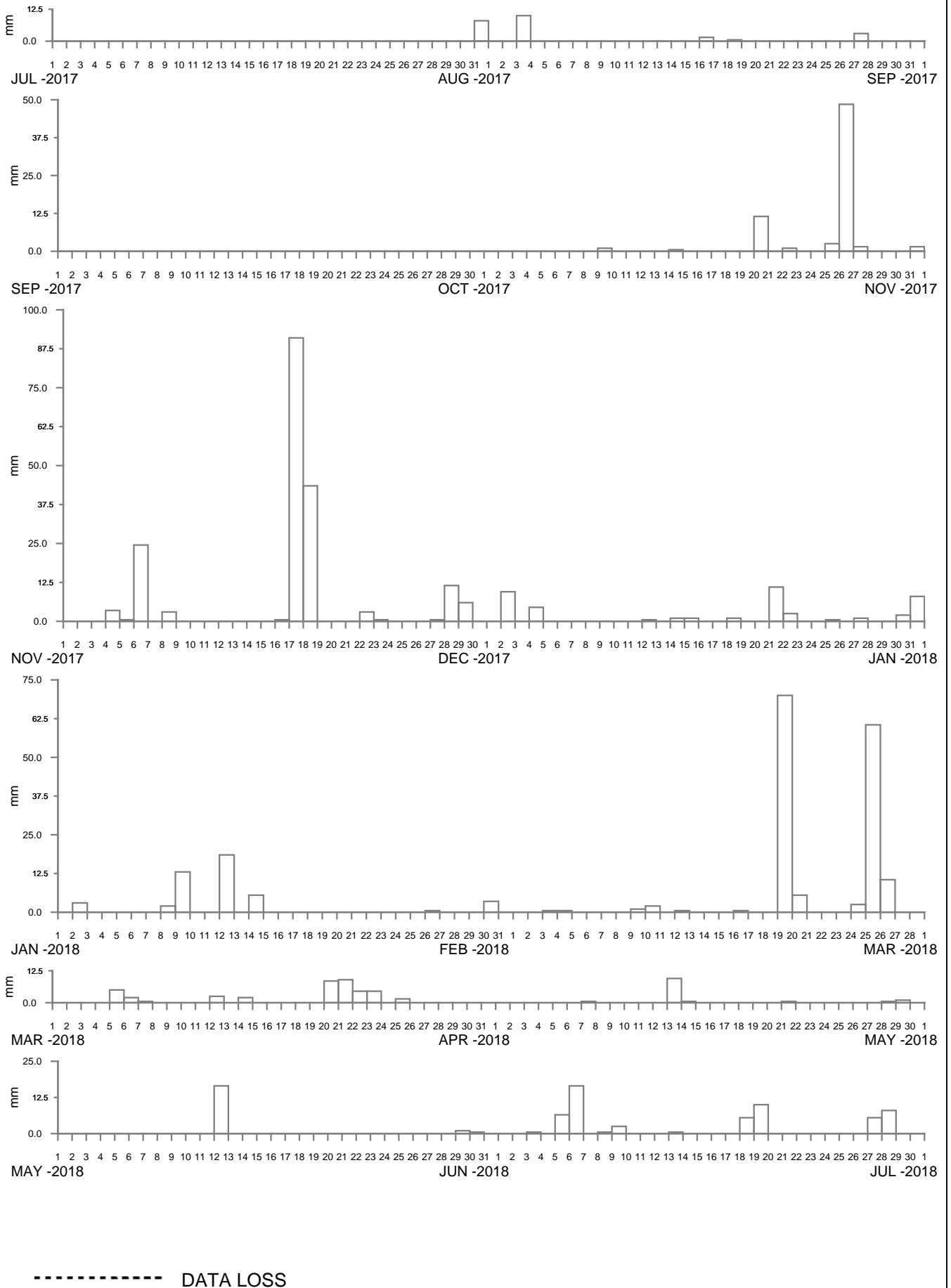


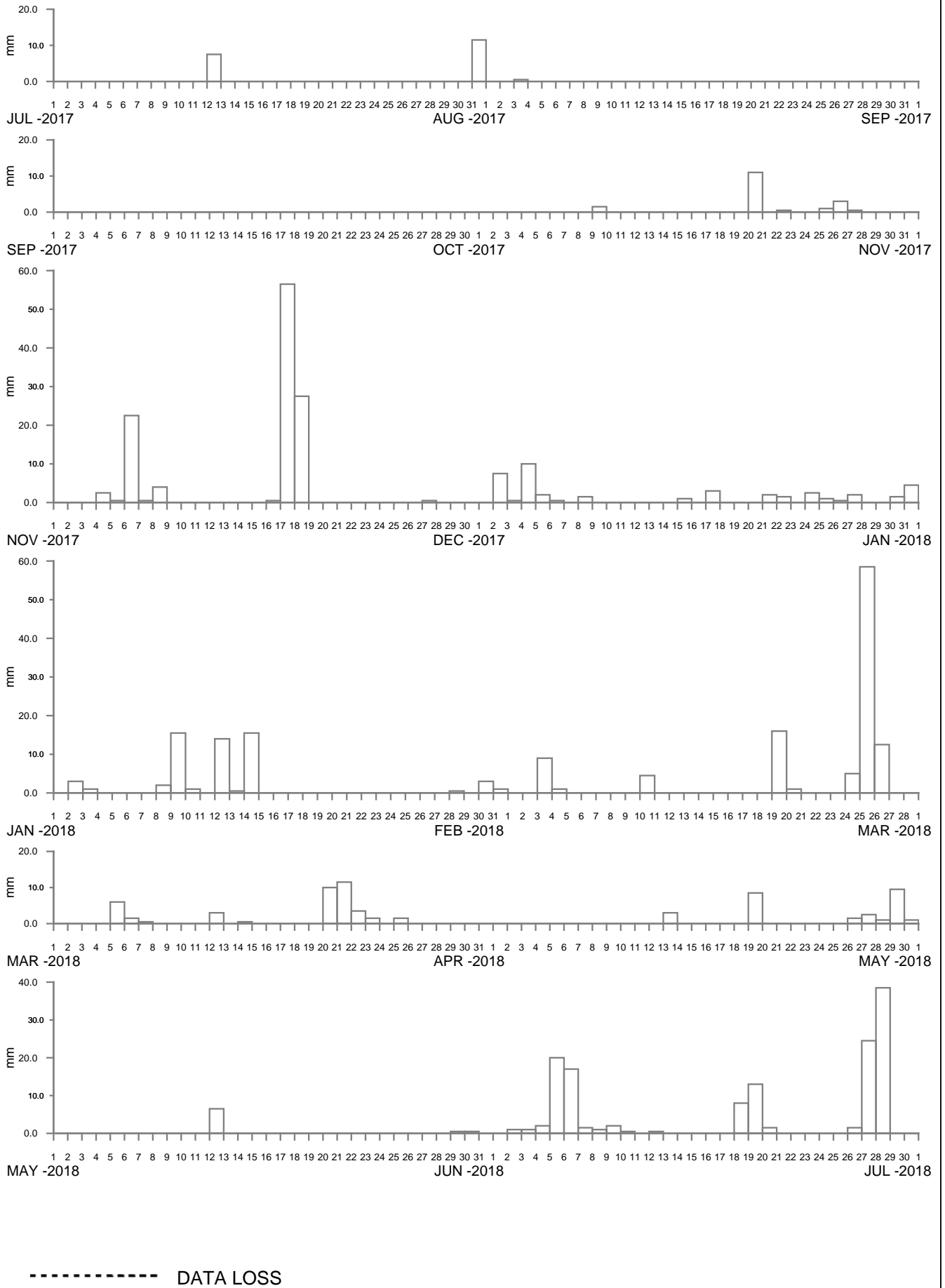
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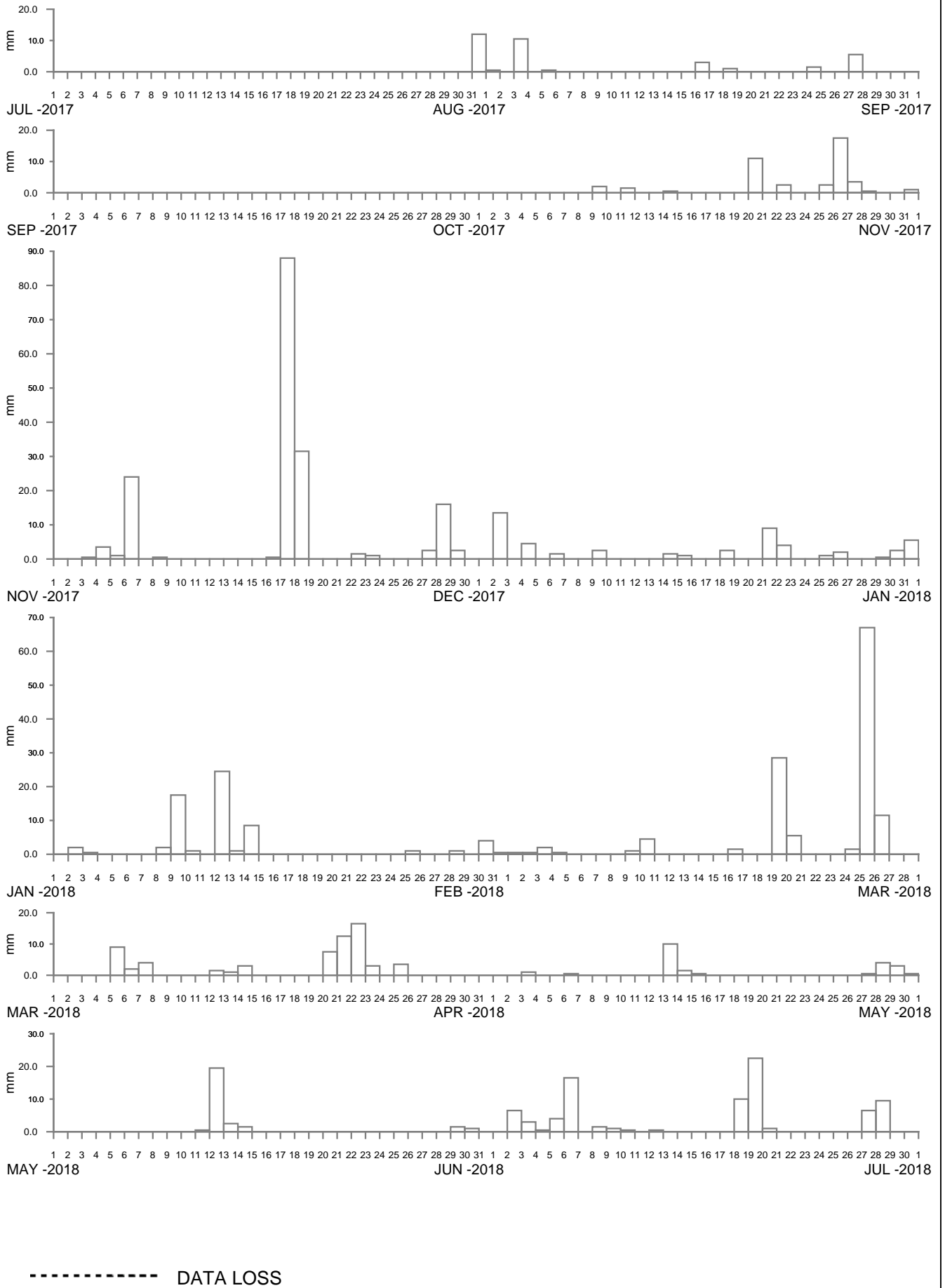


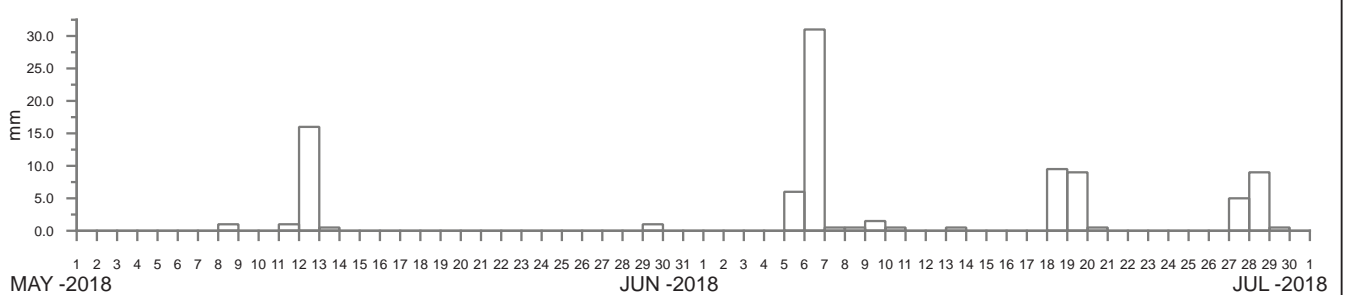
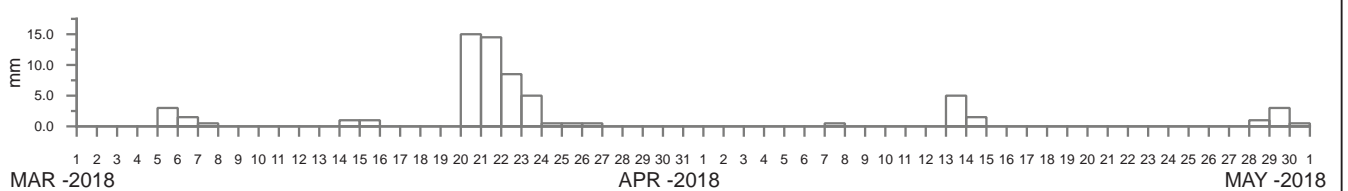
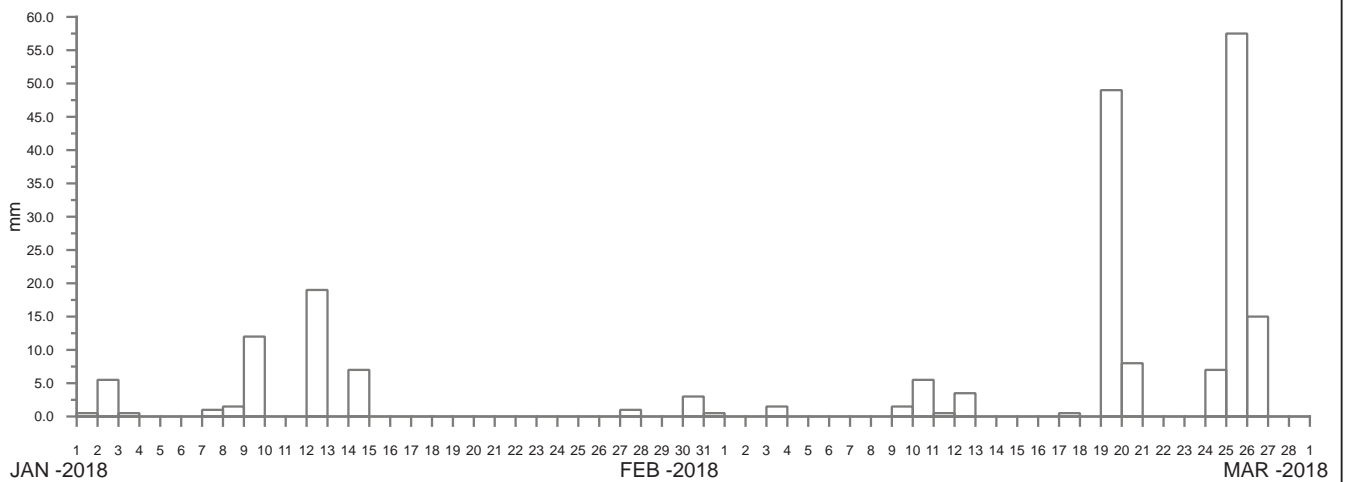
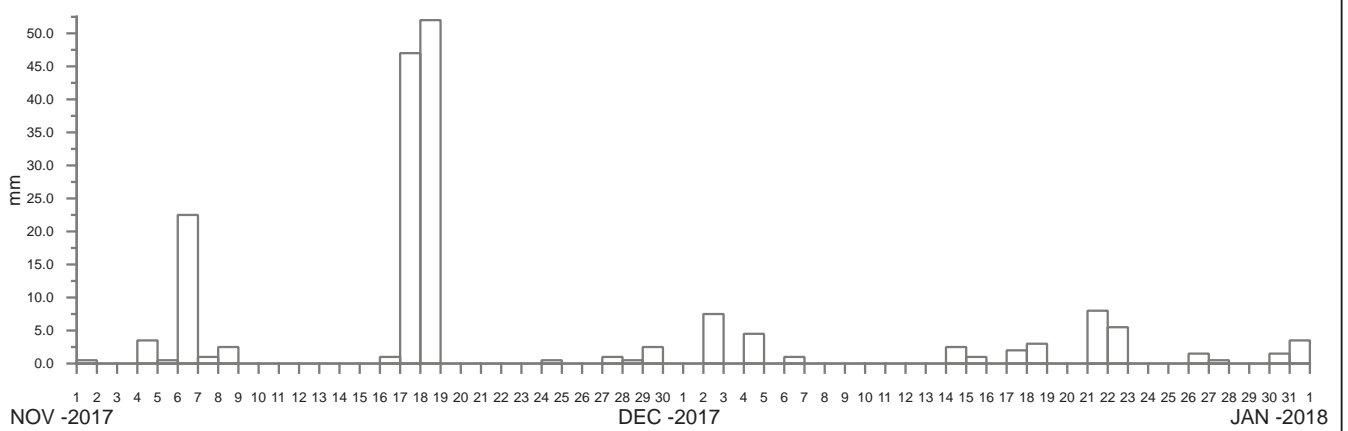
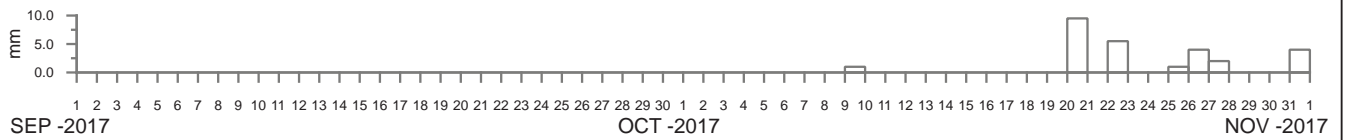
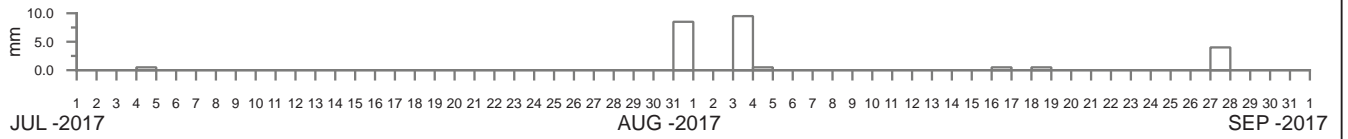




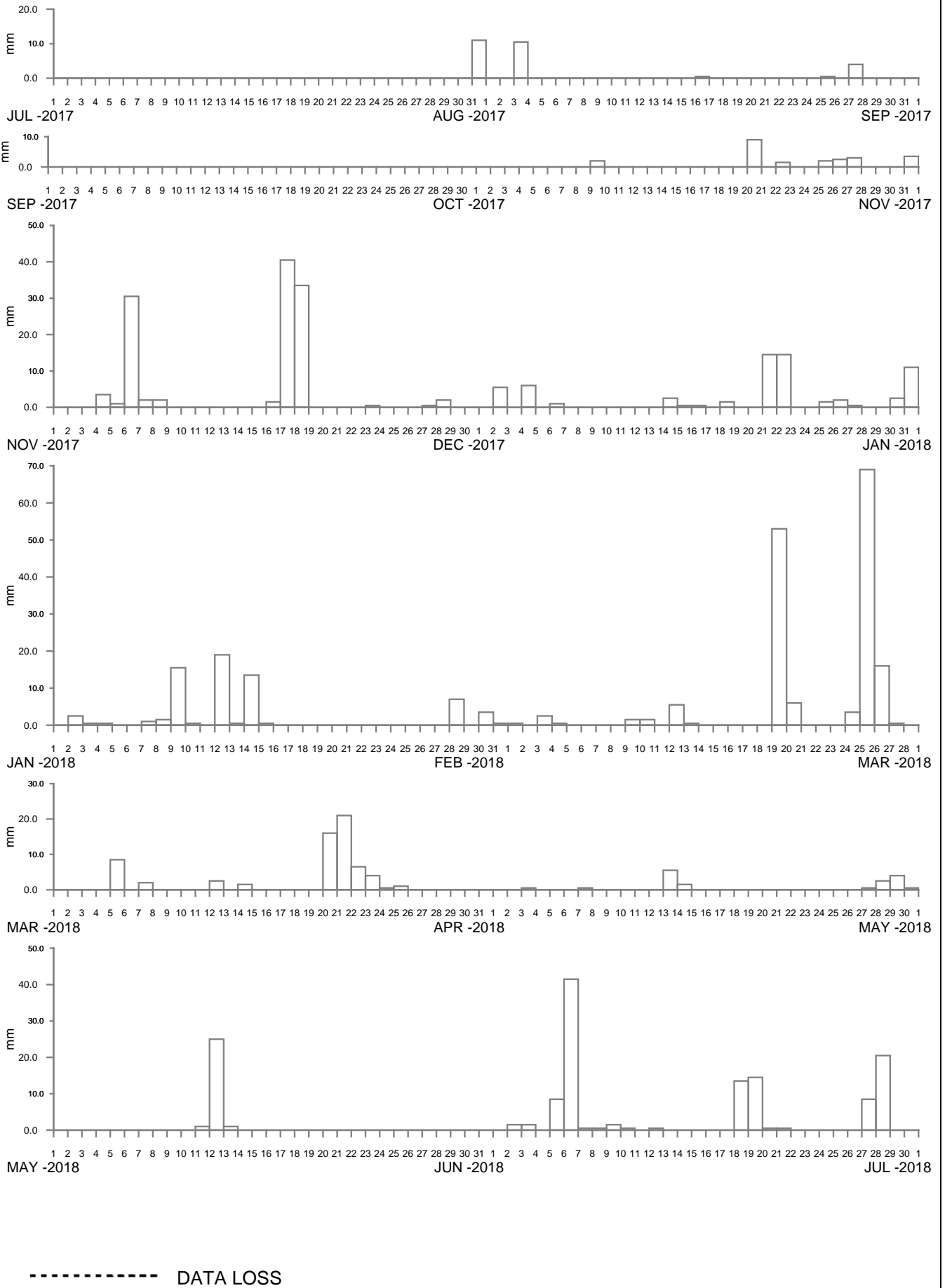


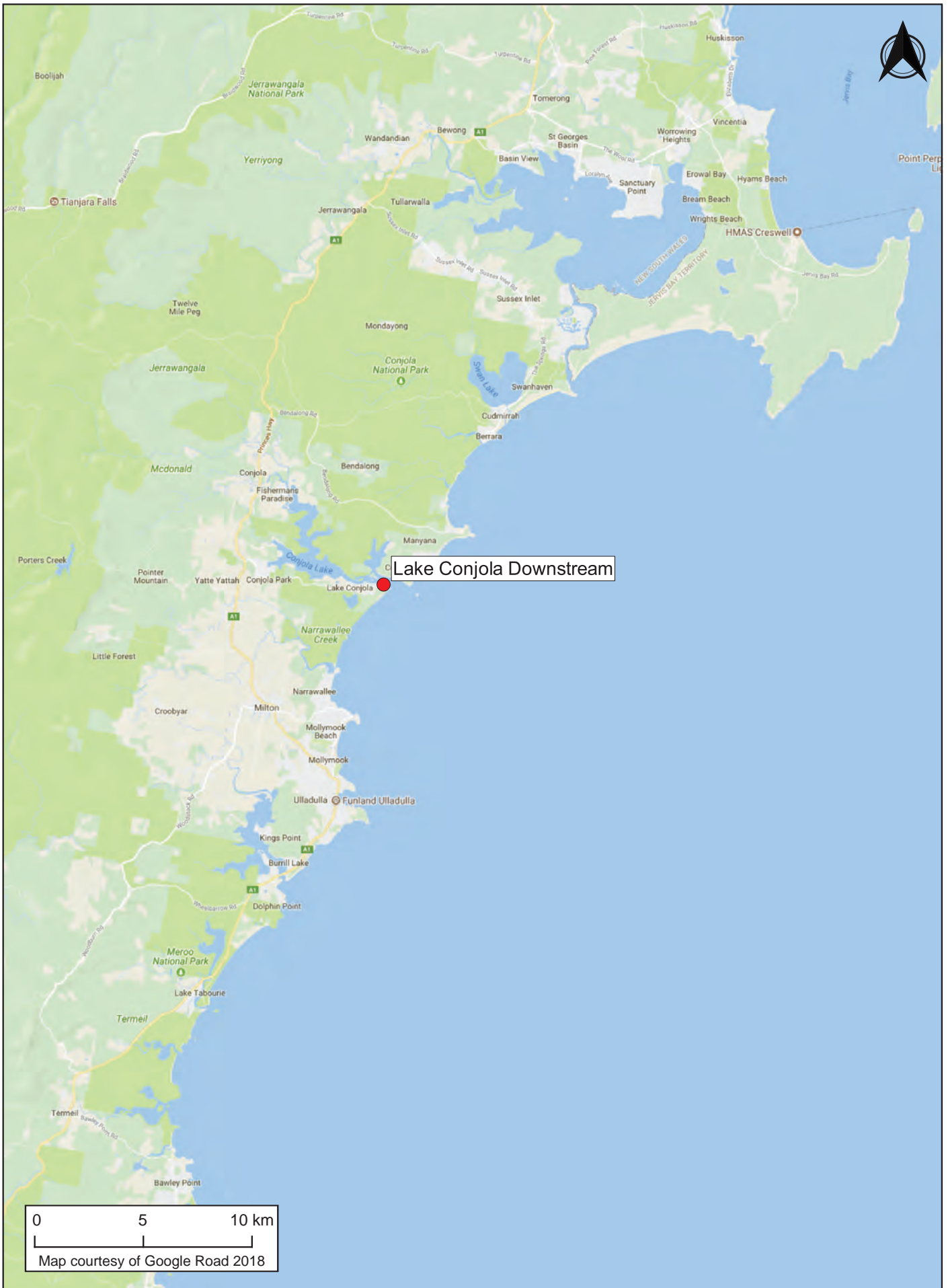


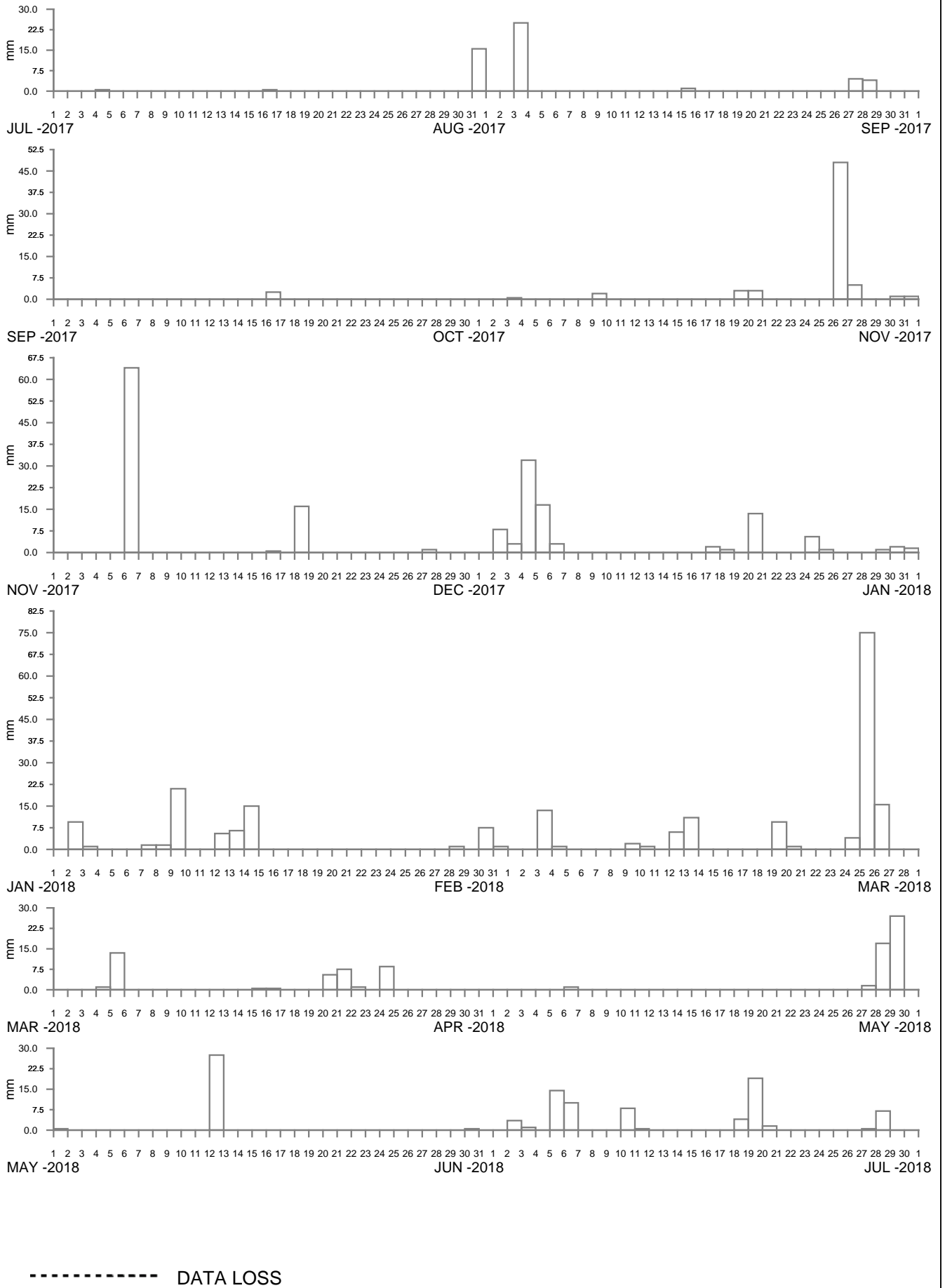


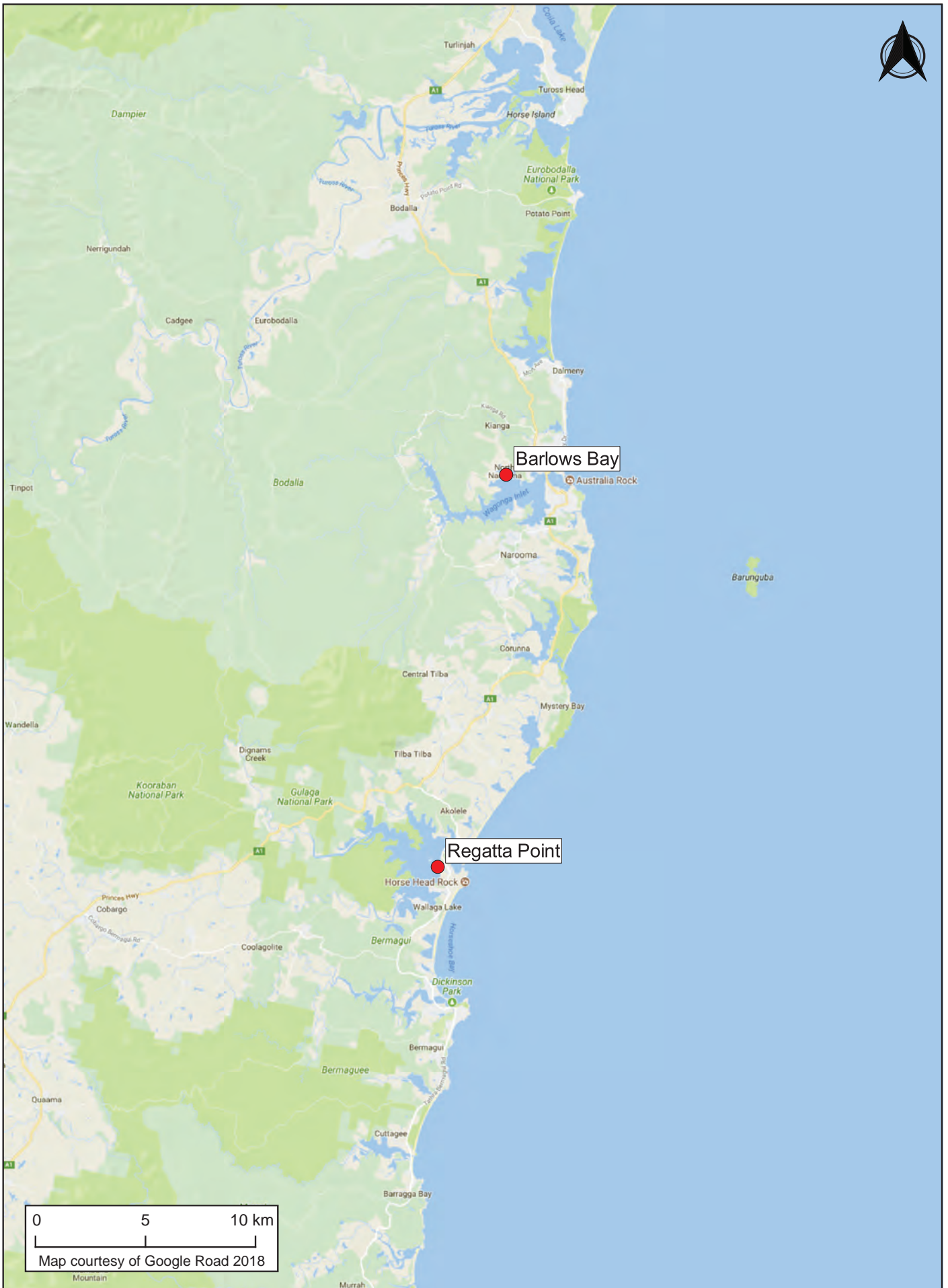


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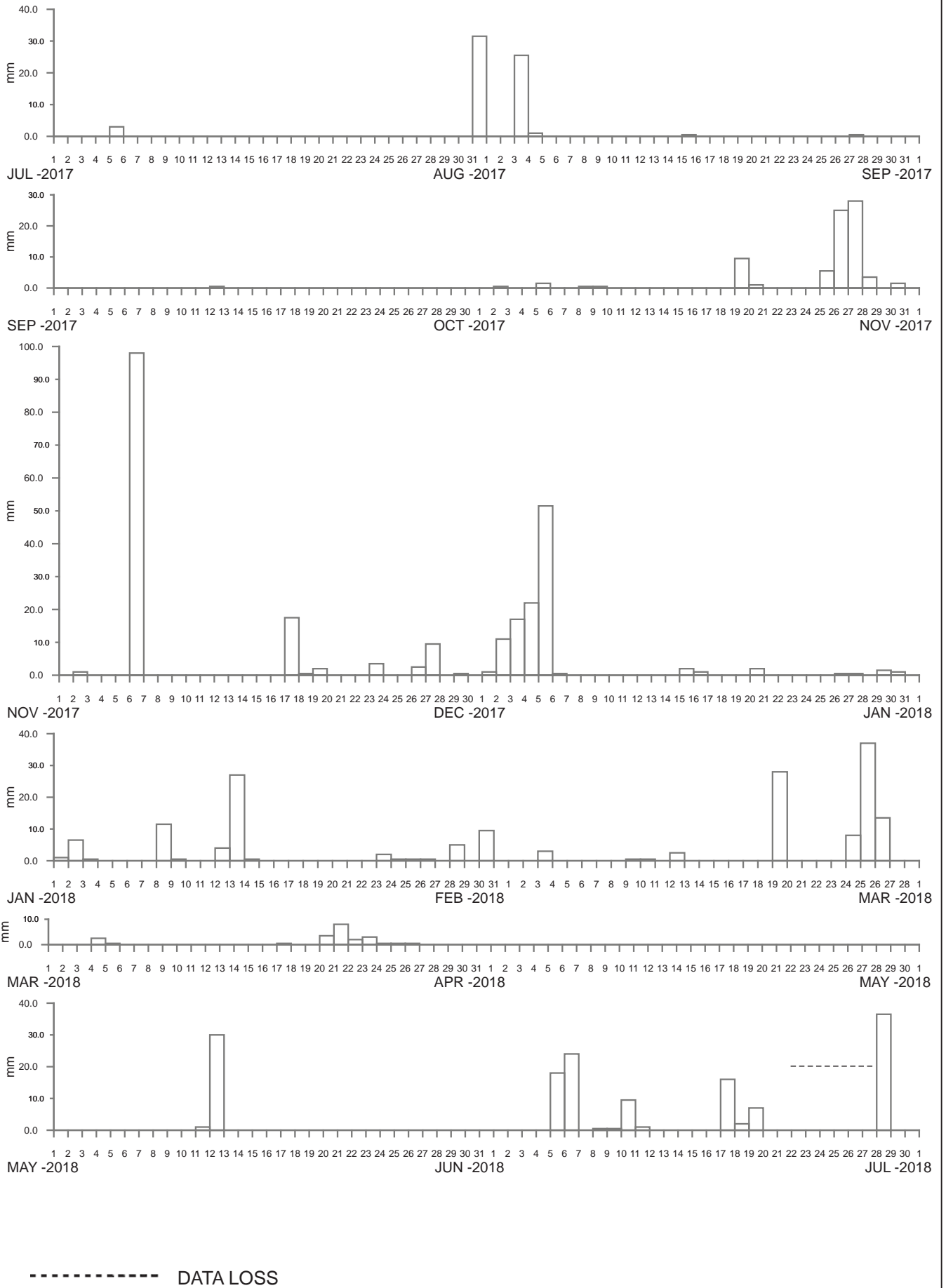








0 5 10 km
Map courtesy of Google Road 2018



Appendix A Station data online

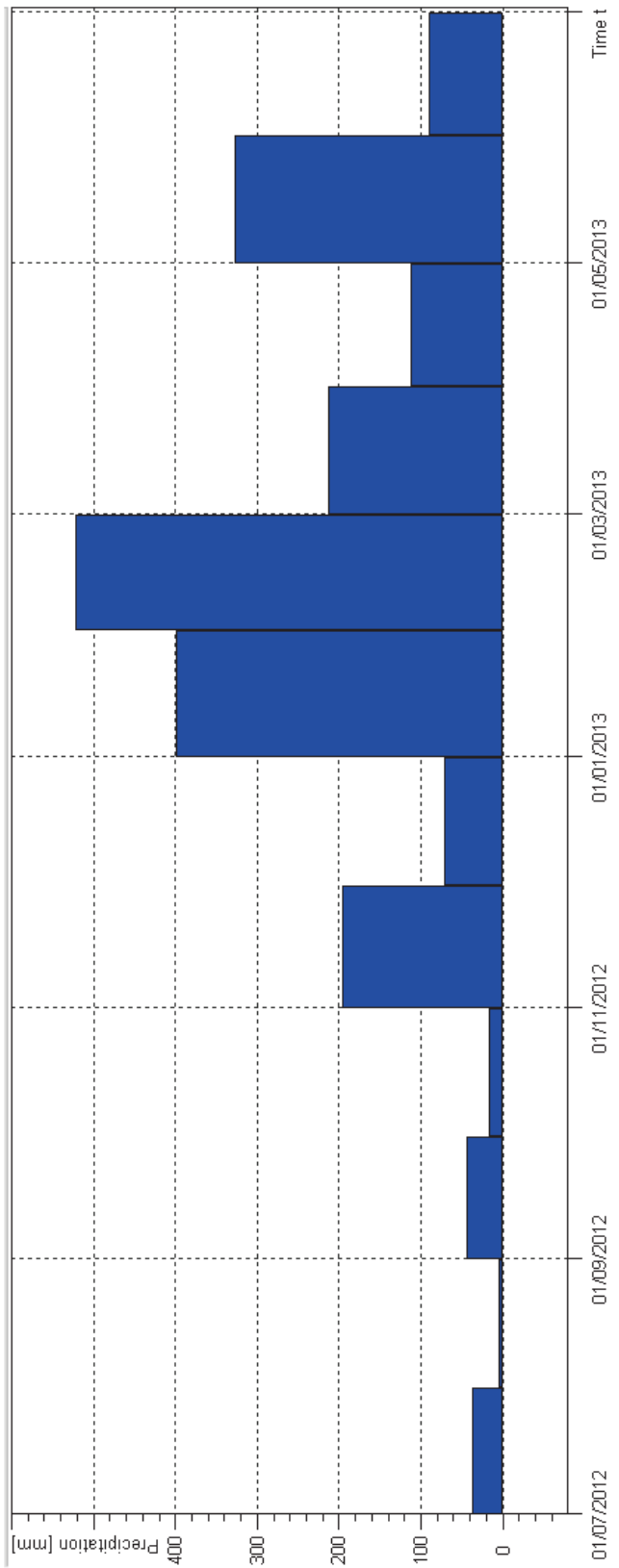
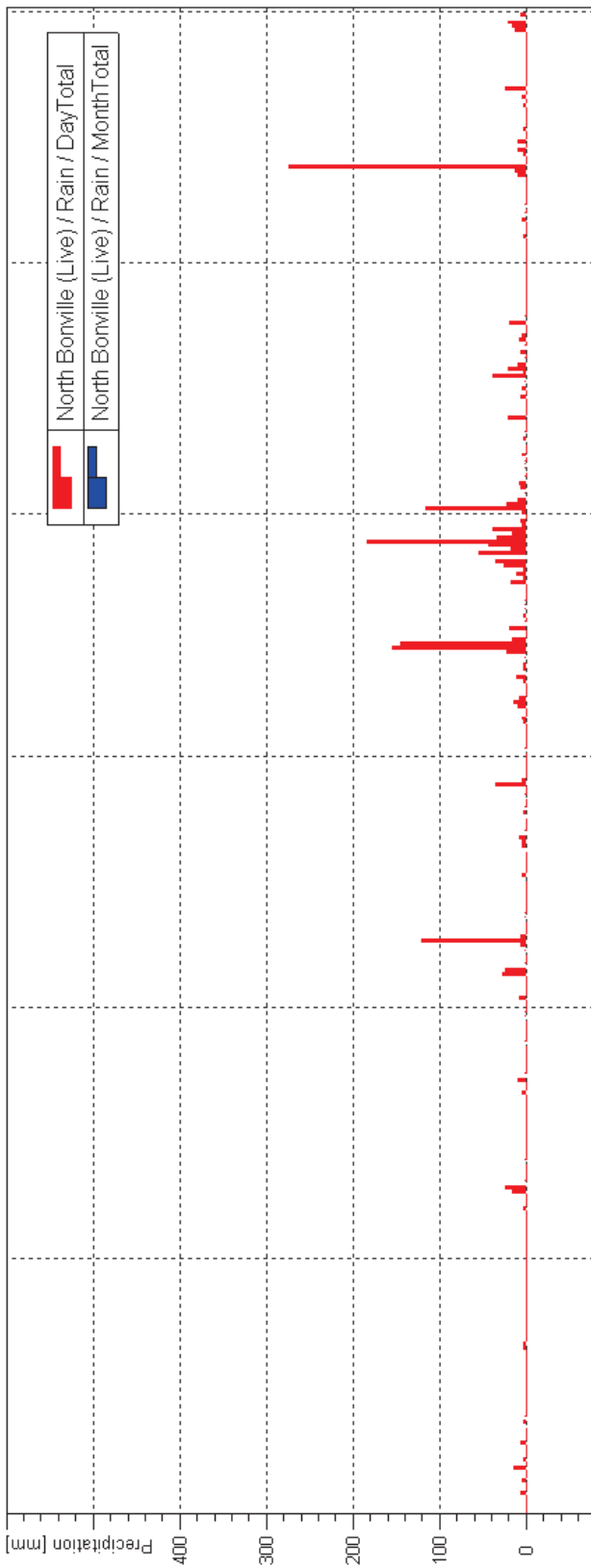
Table A1 Station data online

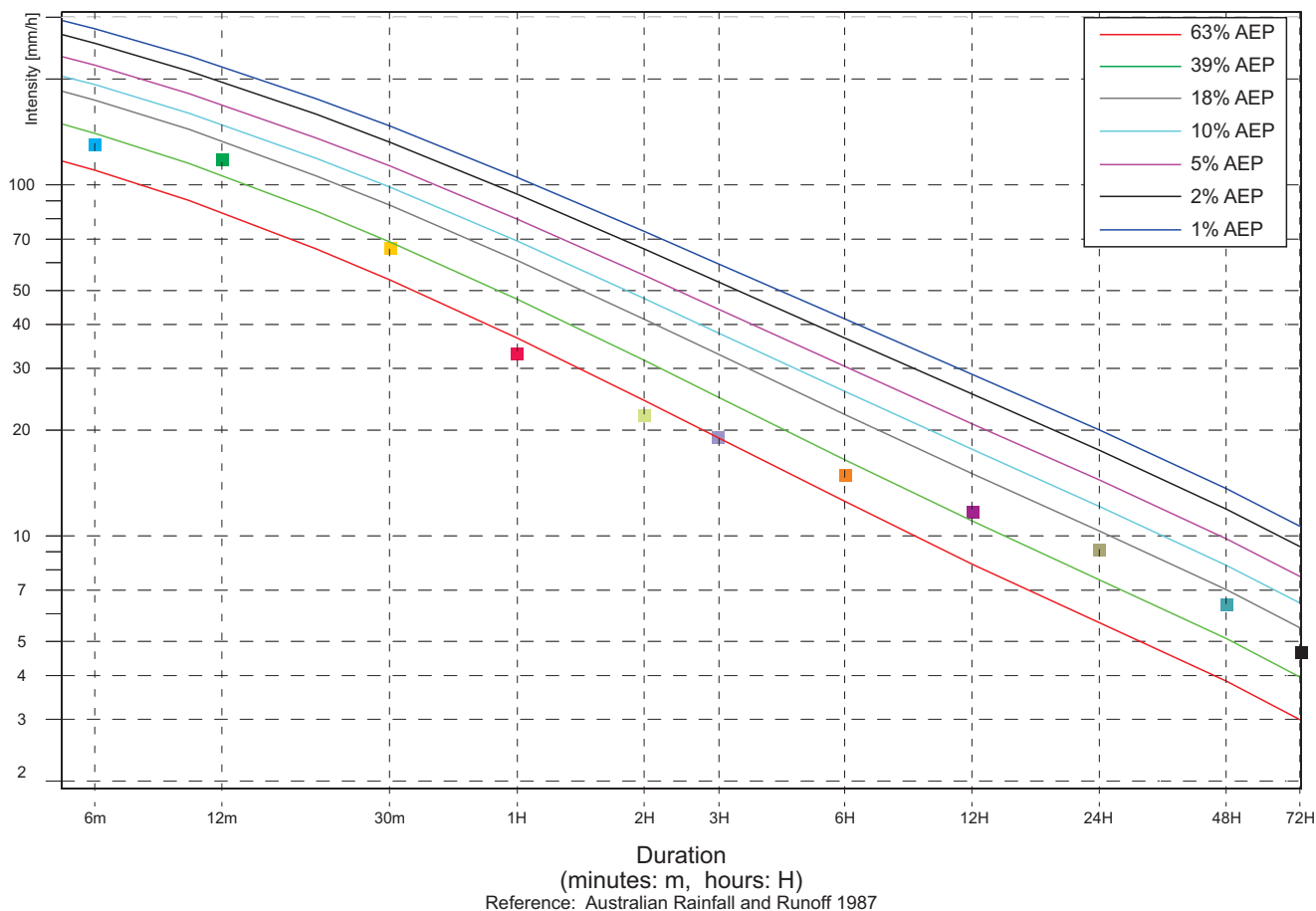
Region	Station	Period of data
Tweed	Cudgera	Aug 1983–ongoing
Brunswick	Main Arm	Sep 1983–ongoing
Brunswick	Huonbrook	May 1986–ongoing
Brunswick	Myocum	Feb 1986–ongoing
Richmond	Lake Ainsworth	Oct 1994–ongoing
Richmond	Empire Vale	May 1998–Jul 2000
Richmond	Wollongbar	Jul 1992–Jul 1994
Clarence	Yamba	Apr 2002–ongoing
Clarence	Wyndora	Jan 1990–Jun 1991
Clarence	Roberts Creek	May 1994–Jun 1996
Clarence	Shannon Creek	Nov 2000–May 2008
Bellinger	Wooli Caravan Park	Jun 1997–ongoing
Bellinger	Perry Drive	Dec 1998–ongoing
Bellinger	Shephards Lane	Dec 1998–ongoing
Bellinger	Red Hill	Nov 1998–ongoing
Bellinger	Newports Creek	Dec 1990–ongoing
Bellinger	Middle Boambee	Dec 1990–ongoing
Bellinger	South Boambee	Apr 1991–April 2015
Bellinger	North Bonville	Dec 1990–ongoing
Bellinger	Gleniffer	Aug 1993–Feb 2007
Bellinger	Bellinger Council	Apr 1993–Jun 2001
Bellinger	Kooroowi	May 1991–ongoing
Bellinger	Thora	Feb 1993–ongoing
Nambucca	Bowraville	Jun 1993–Oct 2001
Nambucca	Stuarts Island Downstream	Oct 1998–ongoing
Nambucca	Utungun	Dec 1991–ongoing
Macleay	Euroka Upstream	Jul 1990–June 2011
Macleay	Aldavilla Downstream	Dec 2011–ongoing
Maria	Green Valley	Sep 1994–ongoing
Hastings	Telegraph Point	Nov 1990–ongoing
Hastings	Lake Cathie	Aug 1993–Jun 2001
Hastings	Ellenborough	Jun 1991–Sep 1999
Camden Haven	Logans Crossing	Dec 1989–ongoing
Manning	Mount George	Mar 1991–ongoing
Karuah	Nabiac	Jun 1984–ongoing
Karuah	Tuncurry	Aug 2002– Oct 2016
Karuah	Tuncurry Downstream	Jun 2016–ongoing
Karuah	Tiona	Jun 2002–Sep 2015
Karuah	Pacific Palms Wharf	Oct 2013–ongoing
Karuah	Tarbuck Bay	May 1996–ongoing
Karuah	Bulahdelah	Aug 1996–ongoing
Hunter	Gostwyck	Oct 1999–ongoing
Hunter	Seaham	Sep 1999–ongoing
Hunter	Hexham Bridge	May 1998–ongoing
Hunter	Belmore Bridge	Sep 1995–ongoing

Region	Station	Period of data
Hunter	Cardiff	Mar 1991–Sept 1996
Macquarie-Tuggerah Lakes	Barnsley	Jan 1988–ongoing
Macquarie-Tuggerah Lakes	Fassifern	Jan 1992–Dec 1997
Macquarie-Tuggerah Lakes	Dora Creek	May 1992–Jul 1999
Macquarie-Tuggerah Lakes	Martinsville	Mar 1988–ongoing
Macquarie-Tuggerah Lakes	Mandalong	Dec 1988–ongoing
Macquarie-Tuggerah Lakes	Wyee	May 1992–ongoing
Macquarie-Tuggerah Lakes	Whitemans Ridge	Apr 1989–ongoing
Macquarie-Tuggerah Lakes	Yarramalong	Feb 1987–ongoing
Macquarie-Tuggerah Lakes	Kulnura	Mar 1989–ongoing
Macquarie-Tuggerah Lakes	Toukley	Dec 1985–ongoing
Macquarie-Tuggerah Lakes	Warnervale	Jan 1986–Apr 2010
Macquarie-Tuggerah lakes	Hamlyn Terrace	Mar 2010–ongoing
Macquarie-Tuggerah Lakes	Wyong Weir Upstream	Jan 1986–Apr 2008
Macquarie-Tuggerah Lakes	Wyong	Jan 1986–Apr 1991
Macquarie-Tuggerah Lakes	Kangy Angy	Aug 2010–ongoing
Macquarie-Tuggerah Lakes	Chittaway	May 1989–Aug 2010
Macquarie-Tuggerah Lakes	Berkeley Vale	Jun 1988–ongoing
Macquarie-Tuggerah Lakes	Mardi Dam	Jun 1988–ongoing
Macquarie-Tuggerah Lakes	Sterland	Apr 1989–ongoing
Macquarie-Tuggerah Lakes	Long Jetty	Sept 1992–Sept 1998
Macquarie-Tuggerah Lakes	Bateau Bay	Jan 1980–ongoing
Macquarie-Tuggerah Lakes	Lisarow	Mar 1989–ongoing
Brisbane Water	Strickland	Dec 1985–ongoing
Brisbane Water	Narara	Apr 1989–ongoing
Brisbane Water	Mount Elliot	Dec 1985–ongoing
Brisbane Water	Wyoming	Aug 1988–ongoing
Brisbane Water	Kincumber	May 1987–ongoing
Hawkesbury	Webbs Creek	Jul 1999–ongoing
Hawkesbury	Colo Junction	Jul 1999–ongoing
Hawkesbury	Sackville Downstream	Jun 1999–ongoing
Hawkesbury	Woy Woy	Jul 1991–Jul 1996
Hawkesbury	Brooklyn	Apr 1991–Jul 1996
Hawkesbury	Cowan	Jun 1991–Jul 1996
Hawkesbury	Penrith	Dec 1994–Jan 1995
Hawkesbury	Narellan Creek	Jan 1994–Sep 1996
Hawkesbury	Camden Life Centre	Mar 1994–Sep 1996
Hawkesbury	Mt Annan School	Feb 1994–Sep 1996
Blue Mountains	Mount Boyce	Nov 1992–Feb 1995
Blue Mountains	Clarence	Nov 1992–Feb 1995
Blue Mountains	Zig Zag	Nov 1992–Feb 1995
Sydney Coastal	Kuringai	Jan 1991–Sep 1996
Sydney Coastal	Wahroonga	Nov 1990–Jul 1996
Sydney Coastal	Beecroft	Sep 1992–Jul 1996
Sydney Coastal	Avalon	Jun 1994–ongoing
Sydney Coastal	Mona Vale	Jun 1994–ongoing
Sydney Coastal	Narrabeen Creek	May 1998–ongoing
Sydney Coastal	Middle Creek	Apr 1995–ongoing
Sydney Coastal	Cromer	Mar 1994–ongoing
Sydney Coastal	Belrose	May 1994–ongoing

Region	Station	Period of data
Sydney Coastal	Allambie	Jun 1999–ongoing
Sydney Coastal	Balgowlah	Aug 1999–May 2005
Sydney Coastal	Curl Curl	Feb 2014–ongoing
Sydney Coastal	North Manly	May 1995–ongoing
Sydney Coastal	Manly Dam	Nov 1995–ongoing
Sydney Coastal	Chatswood	Sep 1992–Jul 1996
Sydney Coastal	Denistone	Jan 1990–Jun 1996
Sydney Coastal	M4 Motorway	Jun 1993–Sep 1996
Sydney Coastal	Homebush Bay	Feb 1993–Mar 1994
Sydney Coastal	Kelso Creek	Nov 1996–ongoing
Wollongong Coastal	Bulli Pass	Sep 1982–Oct 1998
Wollongong Coastal	Rixons Pass	Jun 1985–ongoing
Wollongong Coastal	Russell Vale	Jul 1982–ongoing
Wollongong Coastal	Corrimal Colliery	Jun 1985–Dec 1993
Wollongong Coastal	Mount Pleasant	Jun 1997–ongoing
Wollongong Coastal	Mount Nebo	Sep 1982–Feb 1997
Wollongong Coastal	Mount Kembla	Jun 1985–ongoing
Wollongong Coastal	Dombarton Loop	Jun 1985–ongoing
Wollongong Coastal	Wongawilli	Sep 1982–ongoing
Wollongong Coastal	Port Kembla BHP	Jan 1993–ongoing
Wollongong Coastal	Port Kembla	Sep 1982–ongoing
Wollongong Coastal	Darkes Road	Feb 1994–ongoing
Wollongong Coastal	Cleveland Road	Jun 1985–ongoing
Wollongong Coastal	Huntley Colliery	Jun 1982–ongoing
Wollongong Coastal	Calderwood	Jan 1983–Jun 1985
Wollongong Coastal	Upper Calderwood	Jun 1985–ongoing
Wollongong Coastal	Little Lake	May 1991–Oct 2014
Wollongong Coastal	Little Lake Entrance	May 2014–ongoing
Wollongong Coastal	Airport	Jun 1991–Mar 1995
Wollongong Coastal	North Macquarie	Jul 1985–ongoing
Wollongong Coastal	Clover Hill	Aug 1985–ongoing
Wollongong Coastal	Nurrewin	May 2005–ongoing
Wollongong Coastal	Yellow Rock Road	Jun 1982–ongoing
Wollongong Coastal	Balgownie	Jul 1982–Jun 1987
Wollongong Coastal	Woonona	Jul 1982–Jun 1985
South Coast	Lake Wollumboola	Feb 1999–Oct 2000
South Coast	Lake Conjola Downstream	Jul 2016–ongoing
South Coast	Barlows Bay (Narooma)	Jul 1999–ongoing
South Coast	Regatta Point	Jan 1999–ongoing
South Coast	Merimbula Wharf	Aug 1997–Sep 2001
South Coast	Agnew Wharf	Aug 1997–Jun 2000

Appendix B Sample rainfall data outputs





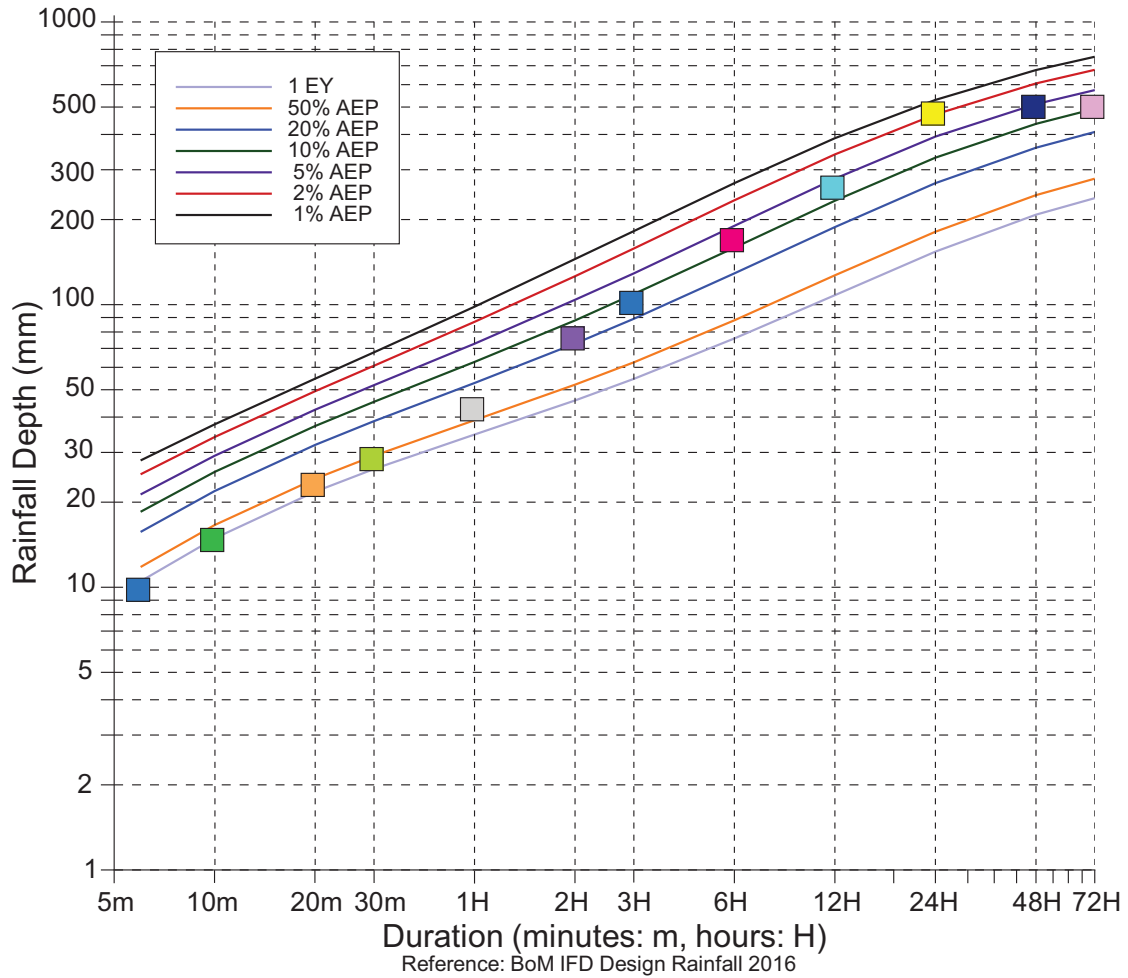
North Bonville Rainfall Intensity 21 January-21 March 2013		
Duration (minutes: m) (hours: H)	Intensity (mm/hr)	Time/Date
■ 6m	130.00	17:14_17/02/2013
■ 12m	117.50	17:14_17/02/2013
■ 30m	66.00	17:26_17/02/2013
■ 1H	33.00	17:26_17/02/2013
■ 2H	22.00	14:44_22/02/2013
■ 3H	19.00	14:42_22/02/2013
■ 6H	14.83	16:40_22/02/2013
■ 12H	11.67	19:56_22/02/2013
■ 24H	9.08	11:12_28/01/2013
■ 48H	6.35	21:46_28/01/2013
■ 72H	4.64	05:54_29/01/2013

Australian Rainfall and Runoff (Institute of Engineers Australia 1987) states:

Use of the terms 'recurrence interval' and 'return period' has been criticised as leading to confusion in the minds of some decision-makers and members of the public. Although the terms are simple superficially, they are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance.

The use of the term 'Average Recurrence Interval' (ARI) can lead to confusion. It is preferable, therefore, to express the rarity of a rainfall event in terms of Annual Exceedance Probability (AEP). For example, 'a rainfall total of 60mm falling in 3 hours at Cudgera has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year' can be easier to understand than the equivalent statement of 'rainfall total of 60mm in 3 hours has an ARI of 100 years'.

Adapted from: <http://www.bom.gov.au/water/designRainfalls/ifd/glossary.shtml>



Duration (minutes:m (Hours: H))	Rainfall Depth (mm)	Time/Date
6m	10.0	05:12_15/03/2017
10m	15.0	05:12_15/03/2017
20m	23.5	05:10_15/03/2017
30m	29.0	03:14_30/03/2017
1H	43.5	23:04_30/03/2017
2H	77.5	22:32_30/03/2017
3H	103.5	21:32_30/03/2017
6H	172.5	18:50_30/03/2017
12H	264.5	01:22_30/03/2017
24H	484.0	01:18_30/03/2017
48H	511.0	18:00_29/03/2017
72H	511.0	18:00_29/03/2017

The probability terminology used for the 2016 design rainfalls is consistent with the probability terminology for the new edition of Australian Rainfall and Runoff (ARR2016). Further details on the new probability terminology can be found in Book 1; Chapter 2; Section 2.2 Terminology of ARR2016 <http://arr.ga.gov.au/arr-guideline>. The main terms used to describe design rainfalls are:
 - *Exceedances per year (EY)*: the number of times an event is likely to occur or be exceeded within any given year.
 - *Annual exceedance probability (AEP)*: the probability or likelihood of an event occurring or being exceeded within any given year, usually expressed as a percentage.
 For further information refer to BoM frequently asked questions: <http://www.bom.gov.au/water/designRainfalls/ifd/ifd-faq.shtml>

Station Name North Bonville (Live)
 Station Number 559050
 MGA Easting (m zone 56) 500592.91
 MGA Northing (m zone 56) 6641143.16

Date	Time	Value [mm]	State of value
26/01/2013	2:35:17	0.5	5 (Very Good)
26/01/2013	2:40:12	0.5	5 (Very Good)
26/01/2013	4:04:04	0.5	5 (Very Good)
26/01/2013	4:04:53	0.5	5 (Very Good)
26/01/2013	4:07:48	0.5	5 (Very Good)
26/01/2013	5:56:18	0.5	5 (Very Good)
26/01/2013	5:57:42	0.5	5 (Very Good)
26/01/2013	5:59:16	0.5	5 (Very Good)
26/01/2013	6:00:32	0.5	5 (Very Good)
26/01/2013	6:01:22	0.5	5 (Very Good)
26/01/2013	6:02:22	0.5	5 (Very Good)
26/01/2013	12:20:33	0.5	5 (Very Good)
26/01/2013	12:20:51	0.5	5 (Very Good)
26/01/2013	12:21:32	0.5	5 (Very Good)
26/01/2013	12:22:02	0.5	5 (Very Good)
26/01/2013	12:22:42	0.5	5 (Very Good)
26/01/2013	12:23:49	0.5	5 (Very Good)
26/01/2013	12:24:37	0.5	5 (Very Good)
26/01/2013	12:25:42	0.5	5 (Very Good)
26/01/2013	12:35:17	0.5	5 (Very Good)
26/01/2013	19:16:58	0.5	5 (Very Good)
26/01/2013	19:49:01	0.5	5 (Very Good)
26/01/2013	19:51:13	0.5	5 (Very Good)
26/01/2013	21:12:07	0.5	5 (Very Good)
26/01/2013	21:55:36	0.5	5 (Very Good)
26/01/2013	22:01:34	0.5	5 (Very Good)
26/01/2013	22:05:28	0.5	5 (Very Good)
26/01/2013	22:10:31	0.5	5 (Very Good)
26/01/2013	22:12:16	0.5	5 (Very Good)
26/01/2013	22:13:47	0.5	5 (Very Good)
26/01/2013	22:15:34	0.5	5 (Very Good)
26/01/2013	22:17:57	0.5	5 (Very Good)

Appendix C Publications of interest

Data Reports

MHL Annual Coastal Rainfall Summaries available:

MHL Report Nos. 610 (90–91), 624 (91–92), 660 (92–93), 699 (93–94), 730 (94–95), 776 (95–96), 874 (96–97), 946 (97–98), 1015 (98–99), 1071 (99–00), 1131 (00–01), 1207 (01–02), 1278 (02–03), 1348 (03–04), 1424 (04–05), 1513 (05–06), 1765 (06–07), 1849 (07–08), 1934 (08–09), 2011 (09–10), 2090 (10–11), 2159 (11–12), 2220 (12–13), 2293 (13–14), 2385 (14–15), 2476 (15–16), 2575 (16–17).

MHL Annual Estuary and River Water Levels Summaries available:

MHL Report Nos. 555 (87–88), 564 (88–89), 582 (89–90), 601 (90–91), 625 (91–92), 659 (92–93), 698 (93–94), 731 (94–95), 778 (95–96), 875 (96–97), 947 (97–98), 1014 (98–99), 1070 (99–00), 1130 (00–01), 1206 (01–02), 1276 (02–03), 1346 (03–04), 1422 (04–05), 1511 (05–06), 1763 (06–07), 1847 (07–08), 1932 (08–09), 2009 (09–10), 2088 (10–11), 2157 (11–12), 2218 (12–13) 2291(13–14), 2383 (14–15), 2474 (15–16), 2573 (16–17).

MHL Annual Ocean Tide Levels Summaries available:

MHL Report Nos. 515 (86–87), 544 (87–88), 563 (88–89), 585 (89–90), 602 (90–91), 628 (91–92), 658 (92–93), 697 (93–94), 732 (94–95), 777 (95–96), 876 (96–97), 947 (97–98), 1013 (98–99), 1069 (99–00), 1129 (00–01), 1205 (01–02), 1277 (02–03), 1347 (03–04), 1423 (04–05), 1512 (05–06), 1764 (06–07), 1848 (07–08), 1933 (08–09), 2010 (09–10), 2089 (10–11), 2158 (11–12), 2219 (12–13) 2292 (13–14), 2384 (14–15), 2475 (15–16), 2574 (16–17).

MHL Annual Wave Climate and Coastal Air Pressure Summaries available:

MHL Report Nos. 547 (87–88), 560 (88–89), 581 (89–90), 600 (90–91), 627 (91–92), 655 (92–93), 695 (93–94), 733 (94–95), 779 (95–96), 877 (96–97), 948 (97–98), 1016 (98–99), 1072 (99–00), 1132 (00–01), 1208 (01–02), 1279 (02–03), 1349 (03–04), 1425 (04–05), 1514 (05–06), 1766 (06–07), 1850 (07–08), 1935 (08–09), 2012 (09–10), 2091 (10–11), 2160 (11–12), 2221 (12–13) 2294 (13–14), 2386 (14–15), 2477 (15–16), 2576 (16–17).

Flood Reports

MHL Flood Reports:

- *New South Wales North Coast Flood Summary June 2005*, MHL Report No. 1426
- *Marshalls Creek Flood Event 30 June 2005*, MHL Report No. 1435
- *New South Wales North Coast January 2006 Flood Summary*, MHL Report No. 1469
- *New South Wales North Coast March 2006 Flood Summary*, MHL Report No. 1482
- *New South Wales Central Coast June 2007 Flood Summary*, MHL Report No. 1754
- *New South Wales Hunter Valley, Wallamba River and Myall River June 2007 Flood Summary*, MHL Report No. 1755

- *New South Wales Hawkesbury and Nepean June 2007 Flood Summary*, MHL Report No. 1756
- *New South Wales Tweed River January 2008 Flood Summary*, MHL Report No. 1801
- *New South Wales Richmond River January 2008 Flood Summary*, MHL Report No. 1802
- *New South Wales Clarence River January 2008 Flood Summary*, MHL Report No. 1803
- *New South Wales Coffs Harbour and Bellinger River Region January 2008 Flood Summary*, MHL Report No. 1804
- *New South Wales Coffs Harbour, Bellinger River and Nambucca River Regions February 2009 Flood Summary*, MHL Report No. 1908
- *New South Wales Coffs Harbour and Bellinger River Regions April 2009 Flood Summary*, MHL Report No. 1913
- *NSW Northern Rivers May 2009 Flood Report*, MHL Report No. 1965
- *NSW North Coast Flood Summary January–March 2013*, MHL Report No. 2202
- *NSW Hunter and Central Coast Flood Summary April–May 2015*, MHL Report No. 2364
- *NSW South Coast Flood Summary August 2015*, MHL Report No. 2397
- *NSW North Coast Flood Summary March 2017*, MHL Report No. 2535

Other references

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors) 2016, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Commonwealth of Australia,

Bureau of Meteorology, *Climate Glossary – Southern Oscillation Index*, retrieved on 04 October 2010 from <http://www.bom.gov.au/climate/glossary/soi.shtml>

The Institution of Engineers, Australia 1987, '*Australian Rainfall and Runoff: A Guide to Flood Estimation*', Institute of Engineers, Australia



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