Philippine Case Study

Quality control on observations from the ASTI-developed weather stations

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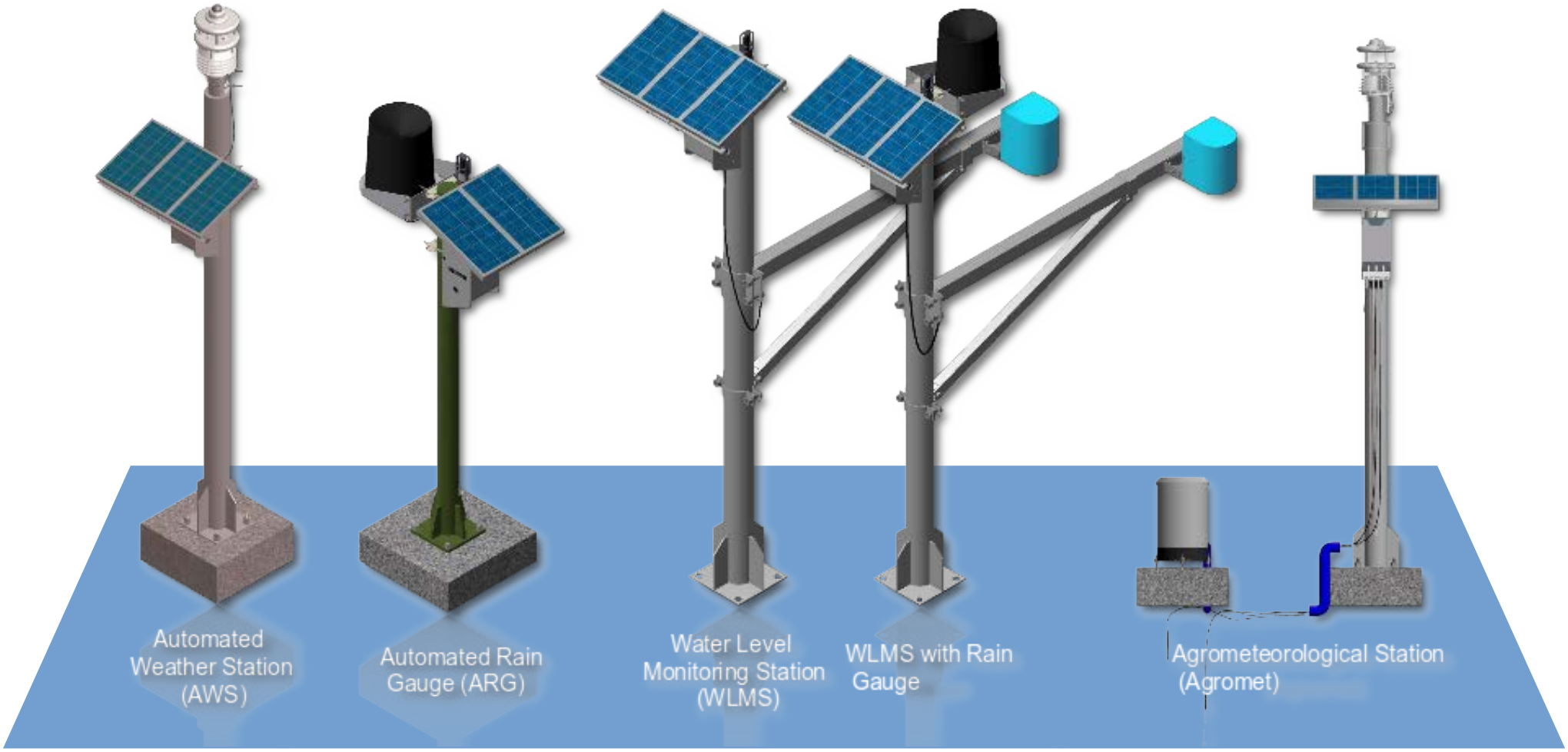
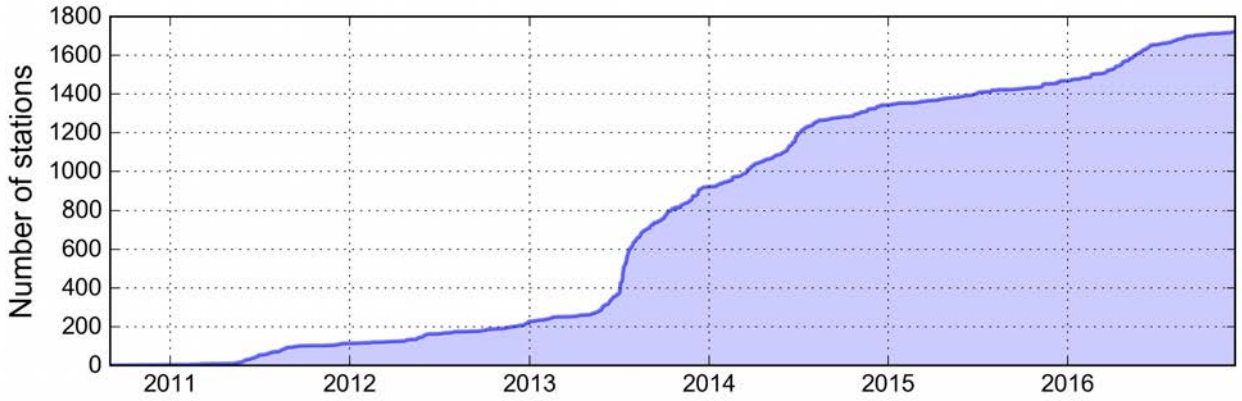
ASTI automatic weather stations



Automated Rain Gauge (ARG)

Water Level Monitoring Station (WLMS)

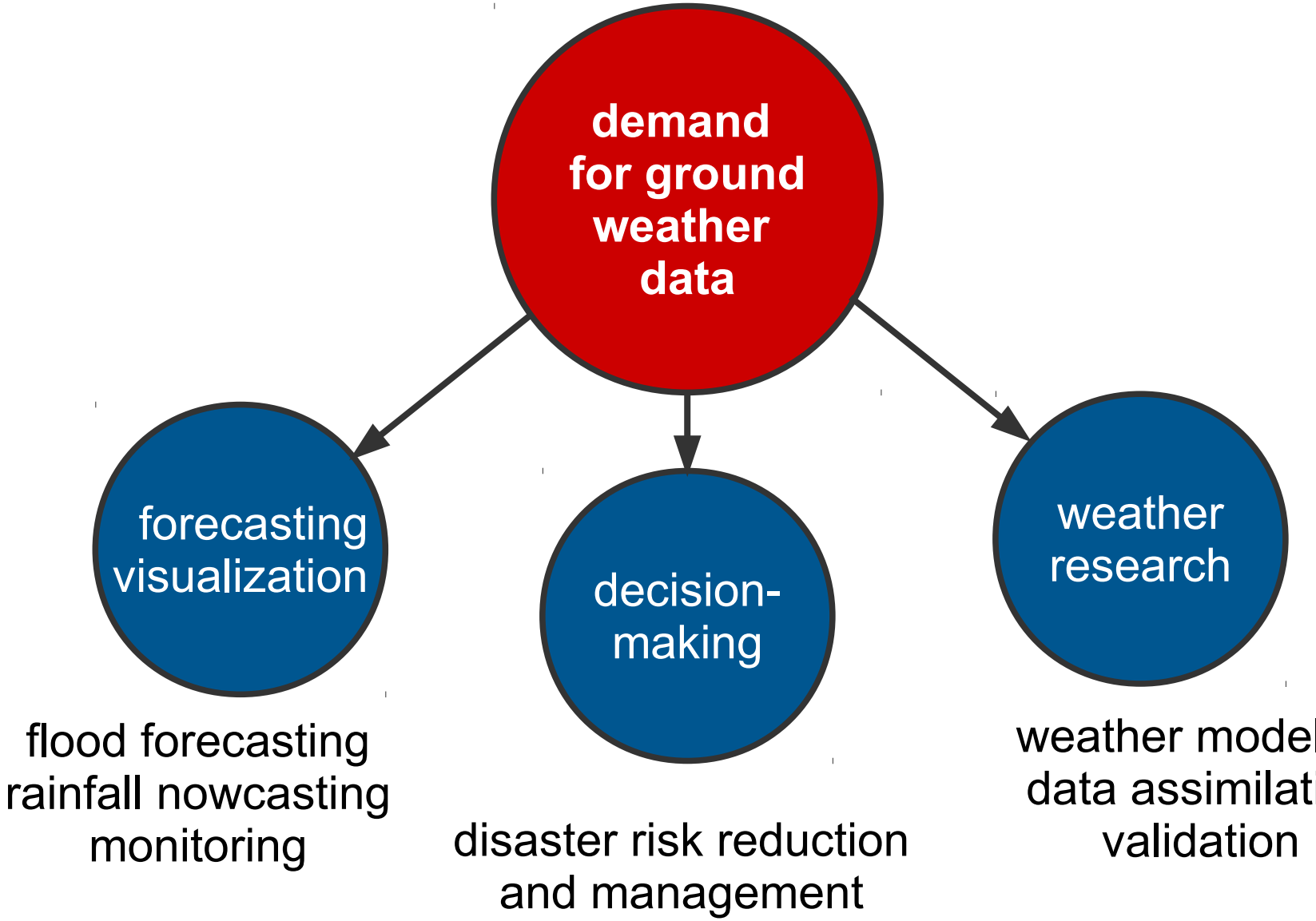
AWS deployment



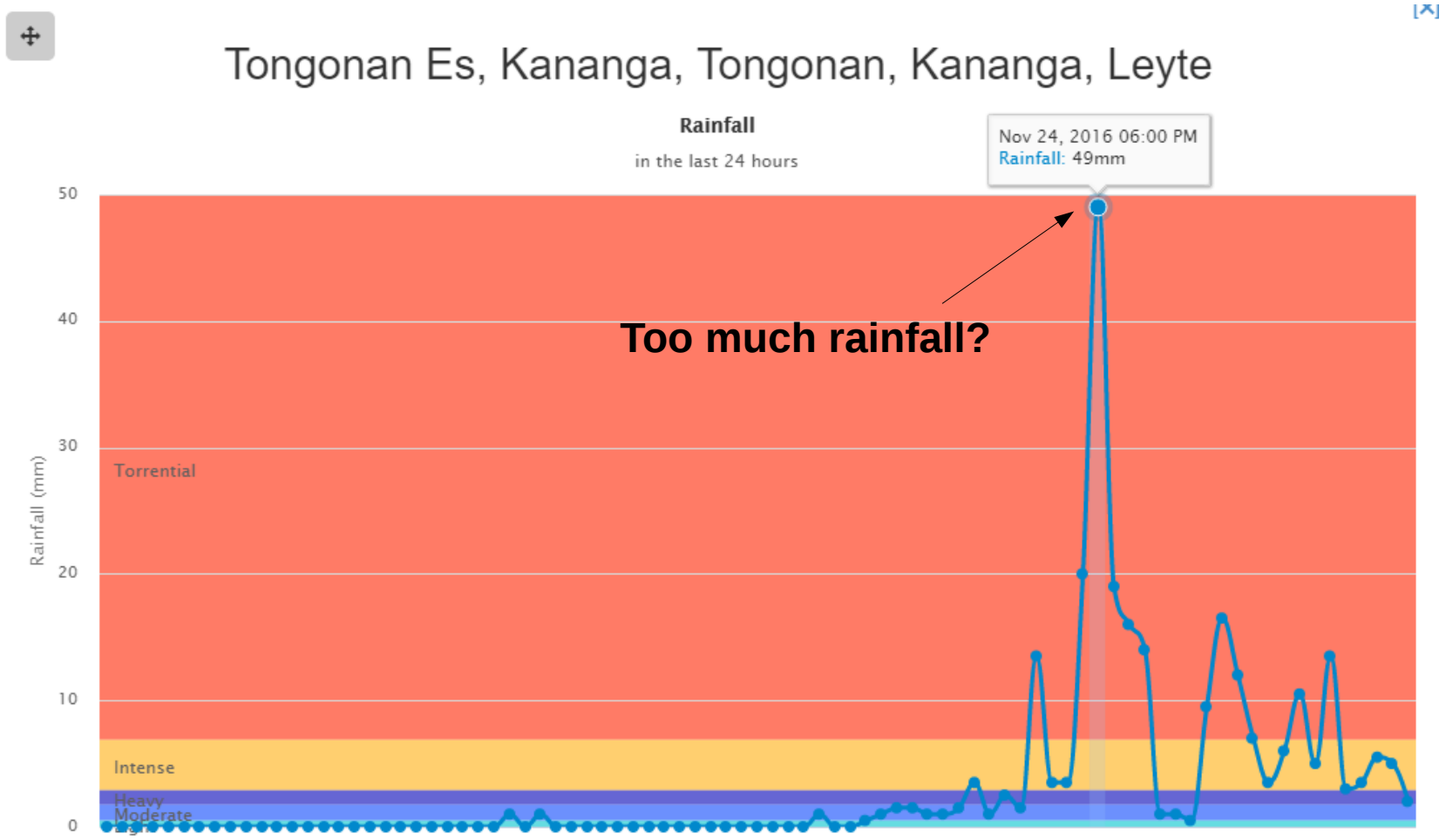
~1800 stations

400 million records

Applications of weather data



An incident reported by a user



** NOAH Program*

Challenges

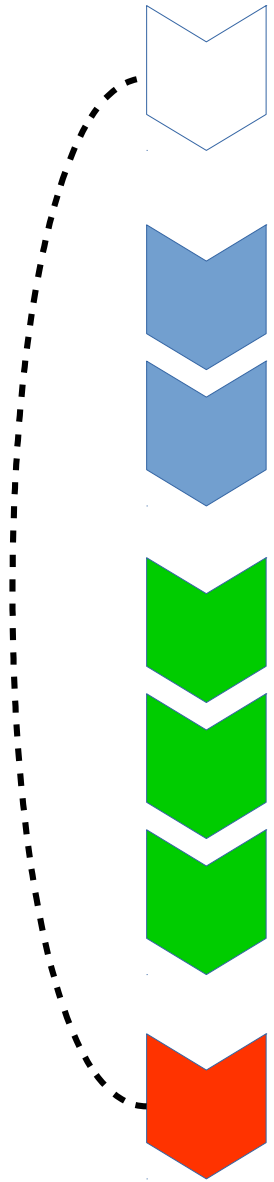
- Logistically difficult to maintain and monitor all stations
- (On the end-user side) correctness of the measurements matter

Motivations of Data Quality Control

- **Make it easier for data users to identify suspicious and erroneous data, and to highlight corrected values**
- avoid the issuance of warnings or advisories based on anomalous data [1]
- Minimize analysis and weather prediction errors [2, 3]
- Identify calibration, measurement, and communication errors
- Detect deterioration and malfunction of sensors

1. Nagata, K. (2010), The importance of data quality control in disaster prevention and mitigation, JMA/WMO workshop on quality management in surface and upper-air observations in RA II (Asia), Tokyo, Japan.
2. Bertrand, C., Gonzales Sotelino, L., and Journee, M. (2013) Quality control of 10-min air temperature data at RMI, Adv. Sci. Res., 10, 1-5.
3. Qin, Z.K., Zou, X., Li, G., and Ma X.L. (2010) Quality control of surface station temperature data with non-Gaussian observation-minus-background distributions, J. Geophys. Res., 115, D16312.

Quality control checks



Geolocation check
(operates on the station)

Timestamp check

Range check
(inst/accum values)

Step check

Persistence check

Internal consistency check

Spatial consistency check

Quality control checks

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(operates on the station)

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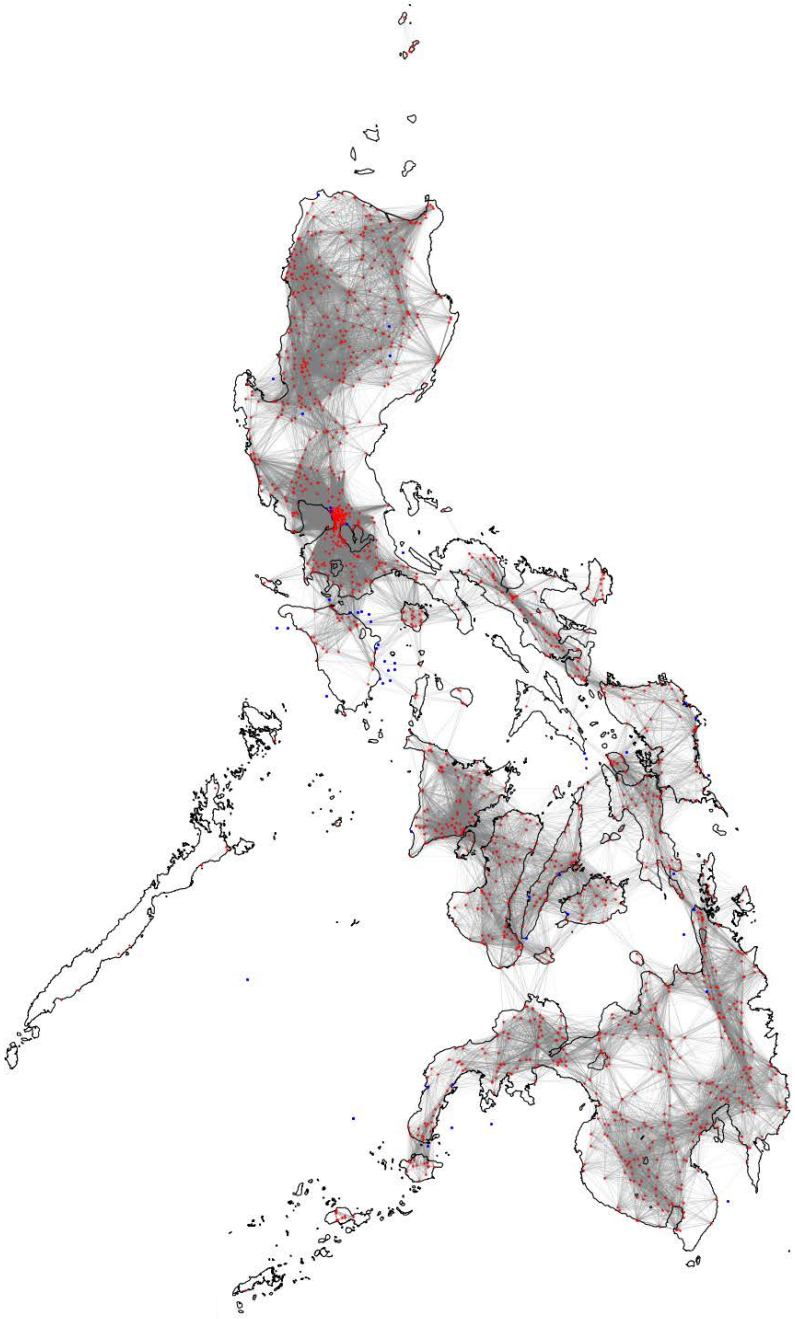


Failure rate statistics

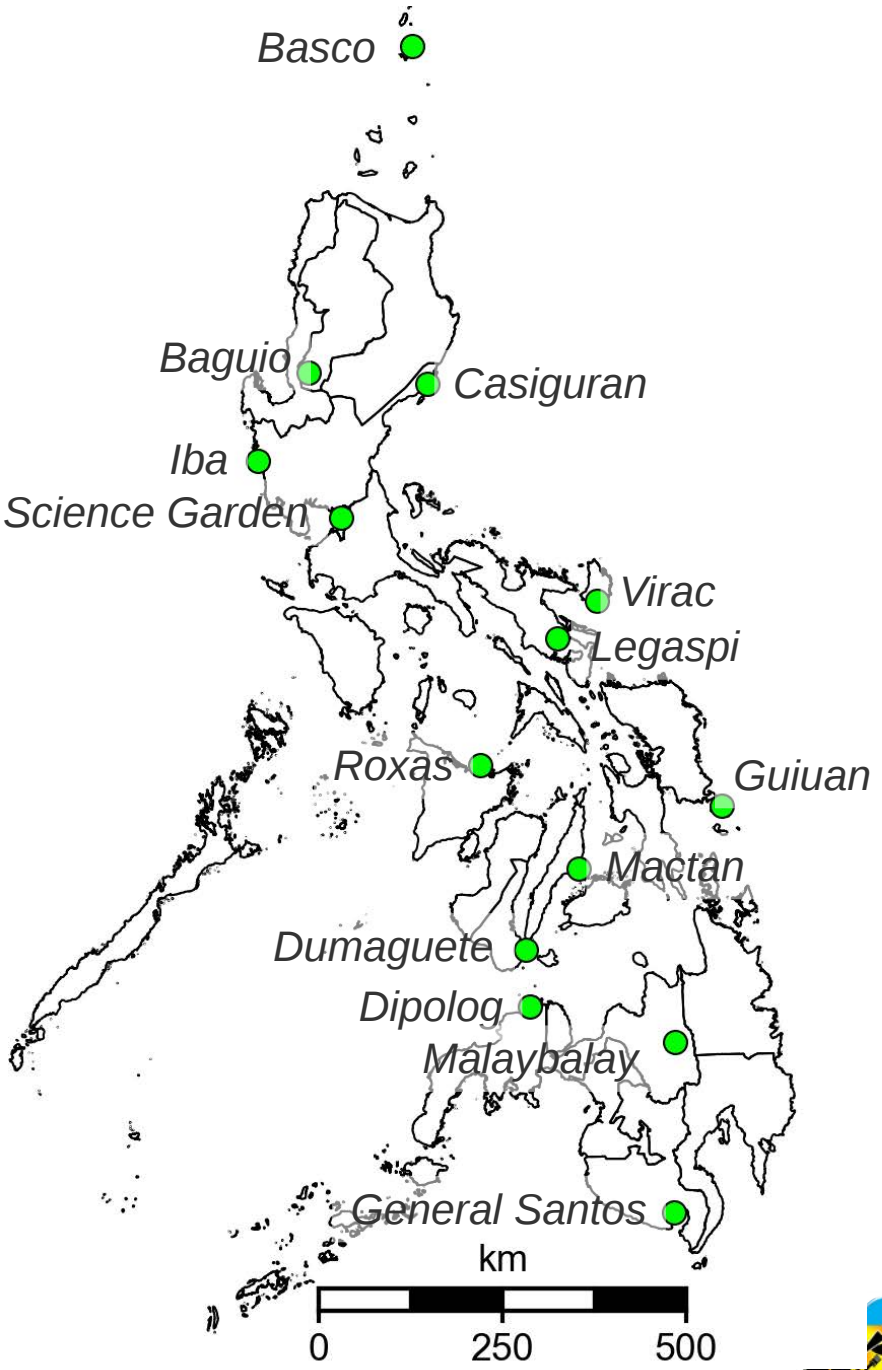
Table 10: Percentage of meteorological data flagged as potentially erroneous by the QC system. Data were collected from all automated weather stations from January 1, 2012 to January 1, 2017. [TC: Timestamp check; VC: value check; SC: step check; PC: persistence check; ICC: internal consistency check; SCC: spatial consistency check]

Variables*	Total obs	Quality control checks					
		TC	VC	SC	PC	ICC	SCC
Air pressure	96,189,676	8.15%	2.73%	1.56%	0.12%	—	0.01%
Air temperature	5,798,174	0.72%	1.61%	0.53%	0.25%	0.00%	0.00%
Relative humidity	5,798,174	0.72%	2.96%	0.11%	1.99%	0.46%	0.00%
Rainfall	98,992,287	8.52%	0.04%	—	—	0.35%	—
Wind speed @2m	5,798,174	0.72%	0.00%	0.01%	65.61%	4.97%	0.00%
Total	212,576,485						

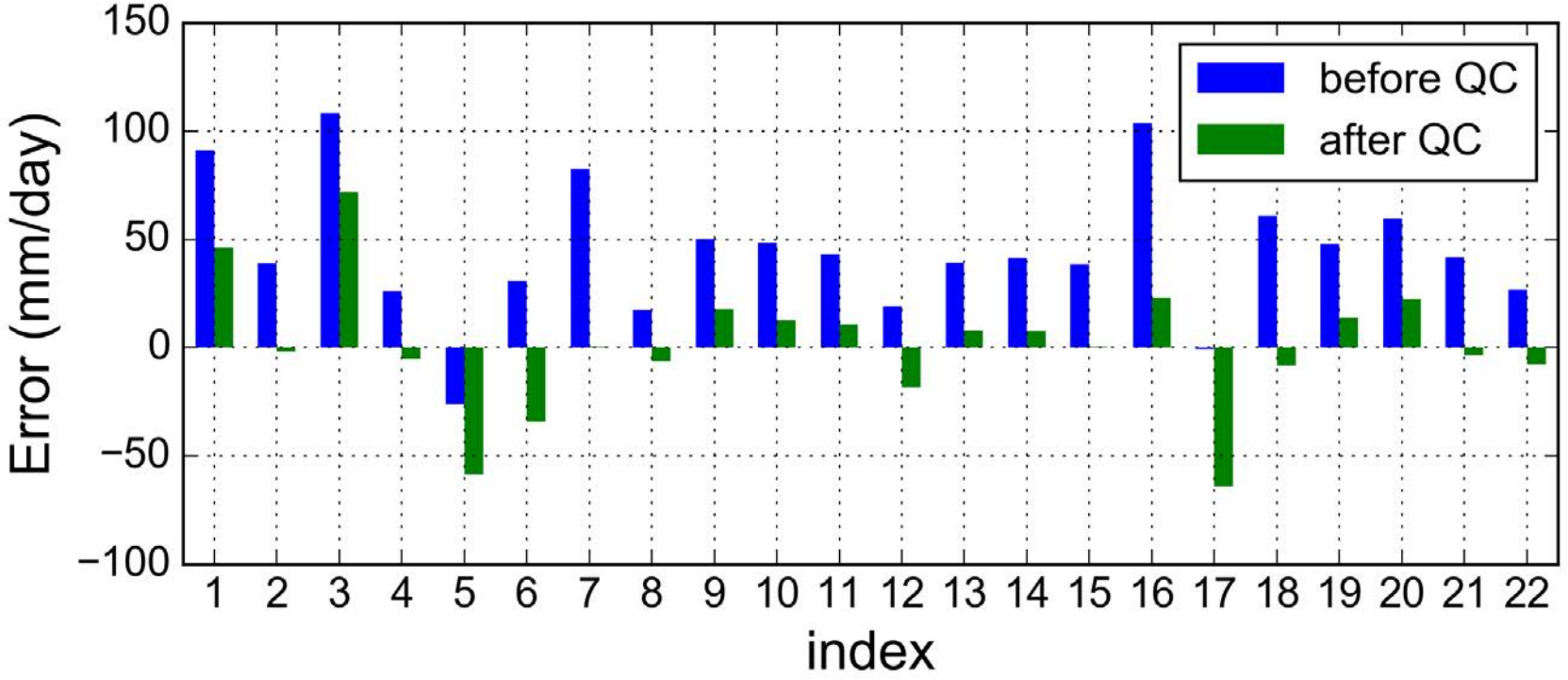
* Only QC flag percentage statistics on selected variables were shown for brevity.

Validation

- 14 selected stations
- Ground truth obtained from PAGASA synoptic station measurements
- Period: 2012 – 2015
- Variables: rainfall and temperature



Validation



	RMSE (before QC)	RMSE (after QC)	RMSE Difference
Temperature(C)	1.77	1.01	**0.76**
Rainfall (mm/d)	14.36	12.04	**2.32**

Automated quality control of ASTI automatic weather station (AWS) meteorological measurements: Quality control algorithm Version 2.0

Jay Samuel Combinido *[1], Marjon De Paz[1], and Jeanette Carlos[1]

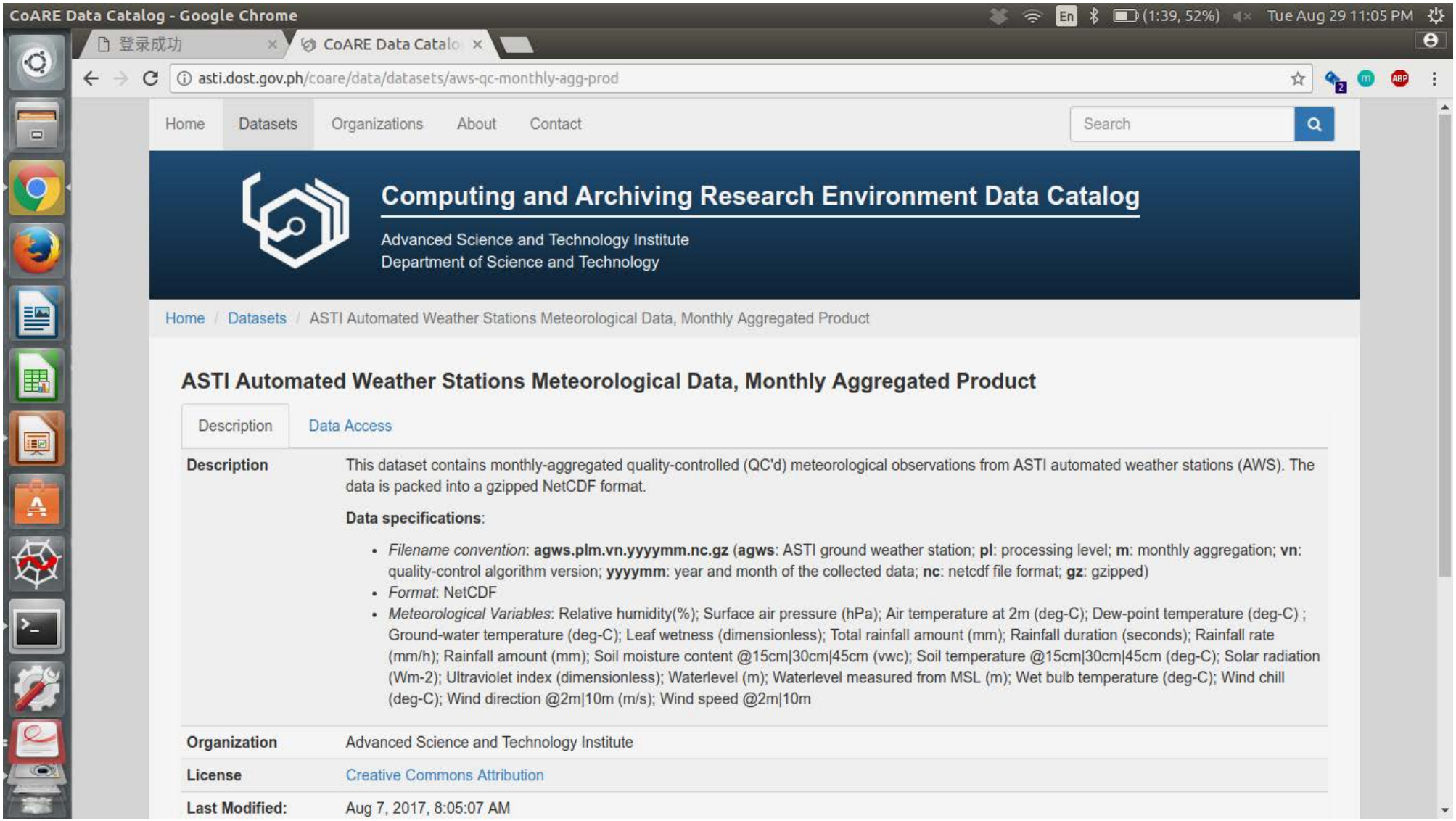
[1]Advanced Science and Technology Institute, Department of Science and Technology, C.P. Garcia, U.P. Campus, Diliman, Quezon City

Version 2.0 from August 25, 2017

Revision History

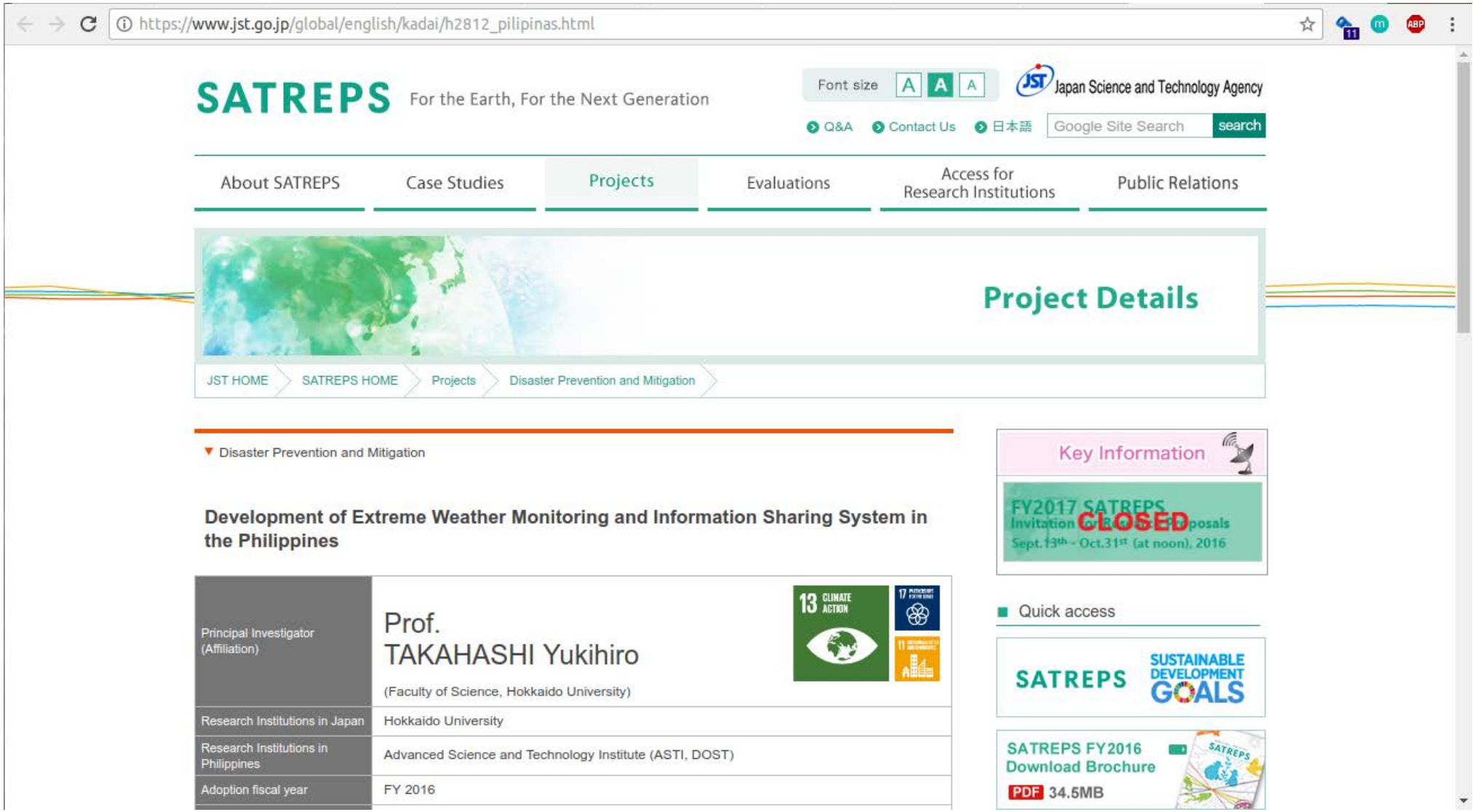
Revision	Date	Author(s)	Description
1.0	June 22, 2017	JSC	Created
2.0	August 25, 2017	JSC	Added spatial consistency check

Data Distribution



Future work

- ground work in place but needs parameter tuning
- continuous improvement to the algorithm
- algorithm optimization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Development of Extreme Weather Monitoring and Information Sharing System in the Philippines
Principal Investigator (Affiliation)
Prof. TAKAHASHI Yukihiro
(Faculty of Science, Hokkaido University)
Research Institutions in Japan
Hokkaido University
Research Institutions in Philippines
Advanced Science and Technology Institute (ASTI, DOST)
Adoption fiscal year
FY 2016
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Summary

- Data quality control is important
- Correct observation data is crucial to forecasters, researchers and decision makers
- Garbage in, garbage out

Thank you for listening. :)