The coastal El Niño-Event of 2017 in Ecuador and Peru - a weather Radar analysis

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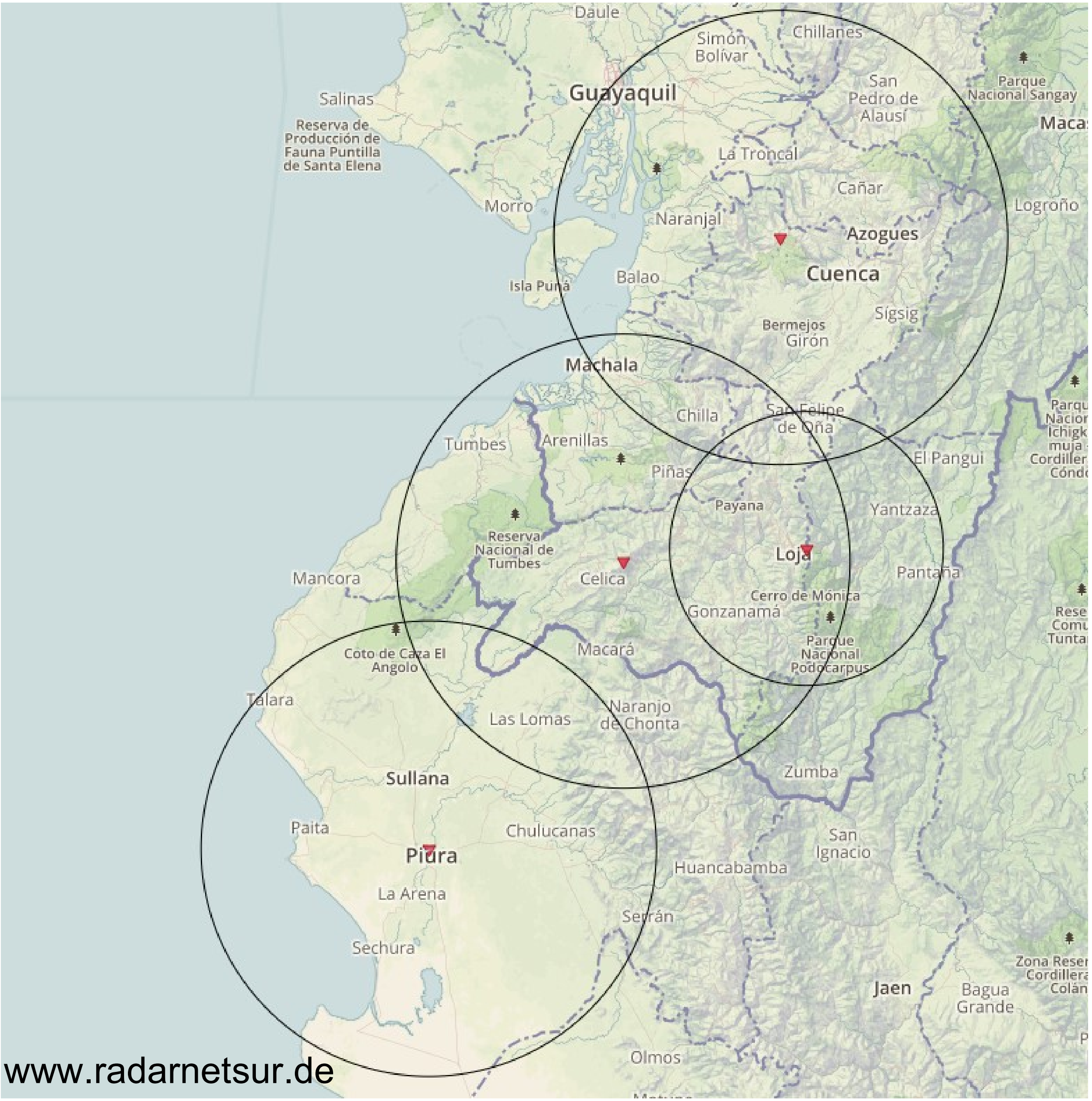
Vienna / Marburg, 4.5.2020

RadarNetPlus (RNP)



www.radarnetsur.de

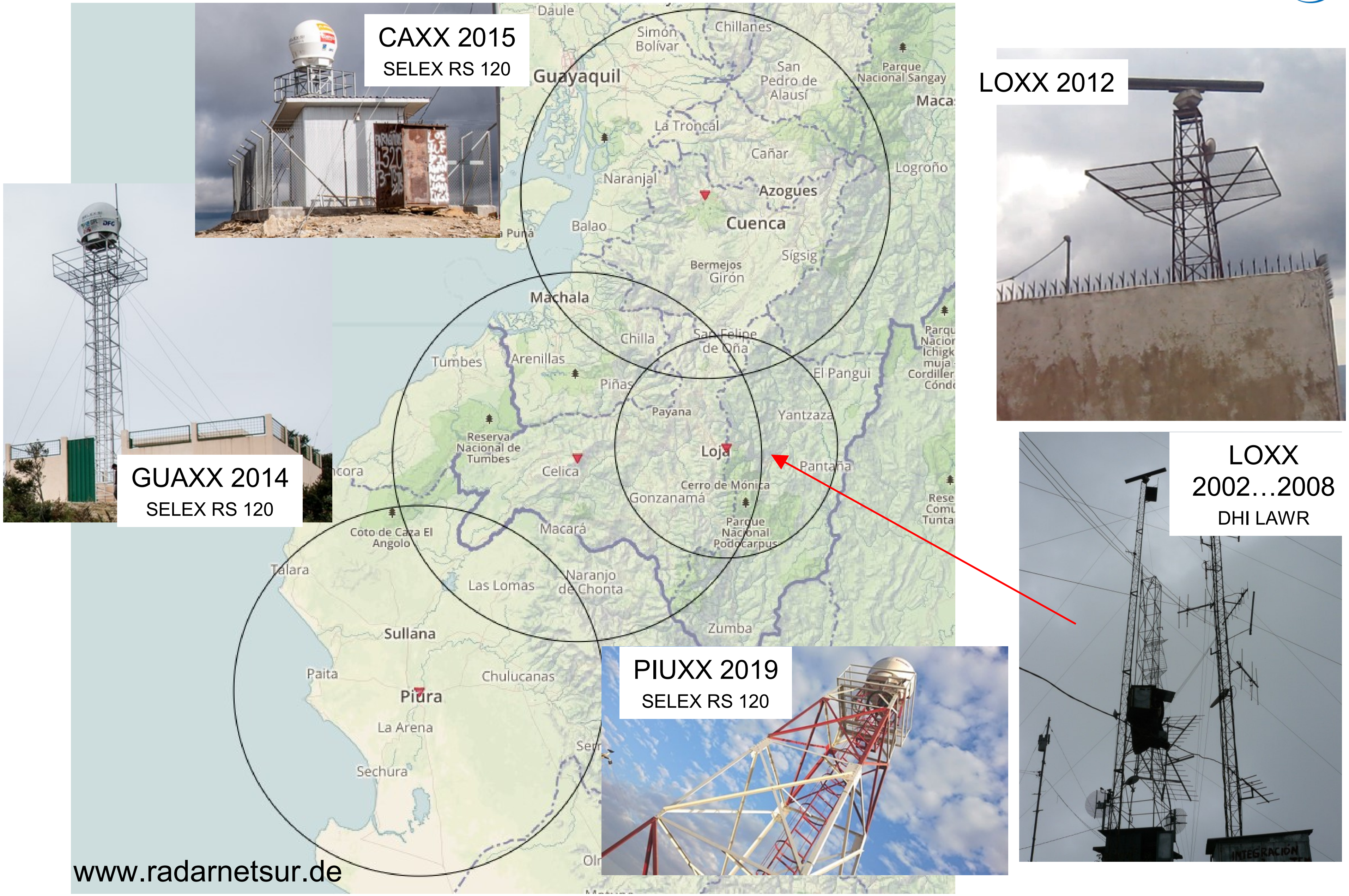
RNP is the first Weather Radar Network operating on the Southamerican Pacific coast.

From 2014 to 2018 about 200.000 Radarimages from three Instruments were recorded (5-min mean reflectivity dbZ)

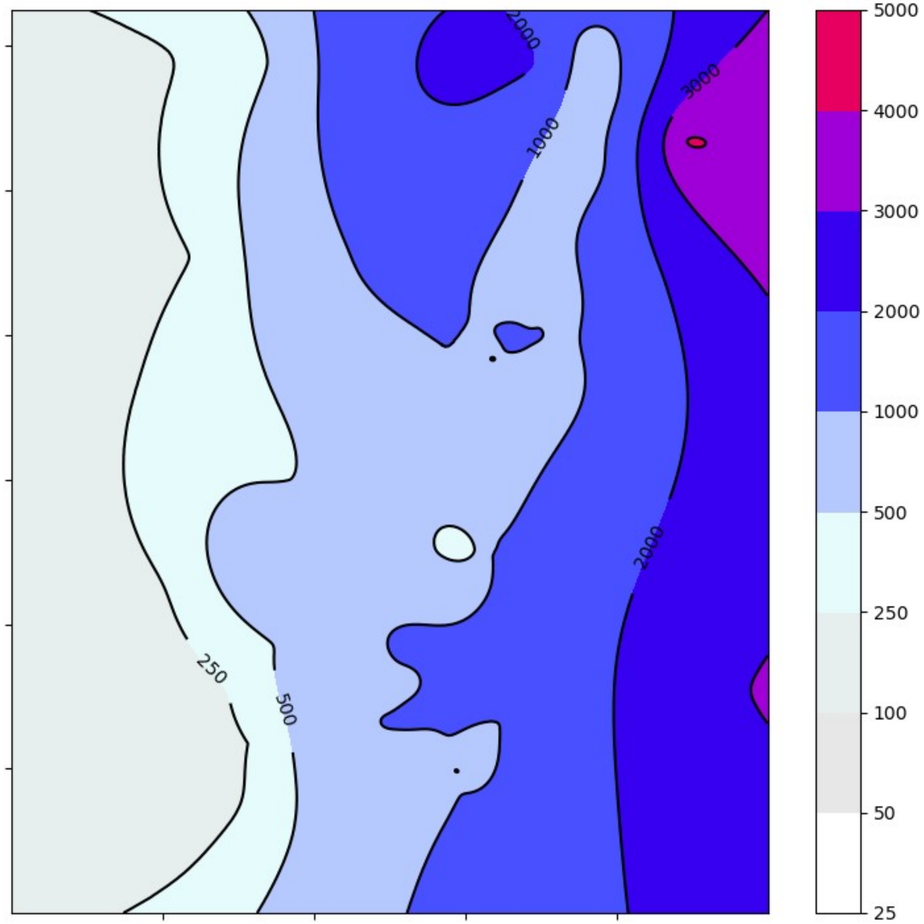
In 2019 a fourth instrument in North Peru was added.

Calibrated by a sparse rain gauge network, a first radar enhanced precipitation map for the period 2014 to 2018 was produced

RadarNetPlus

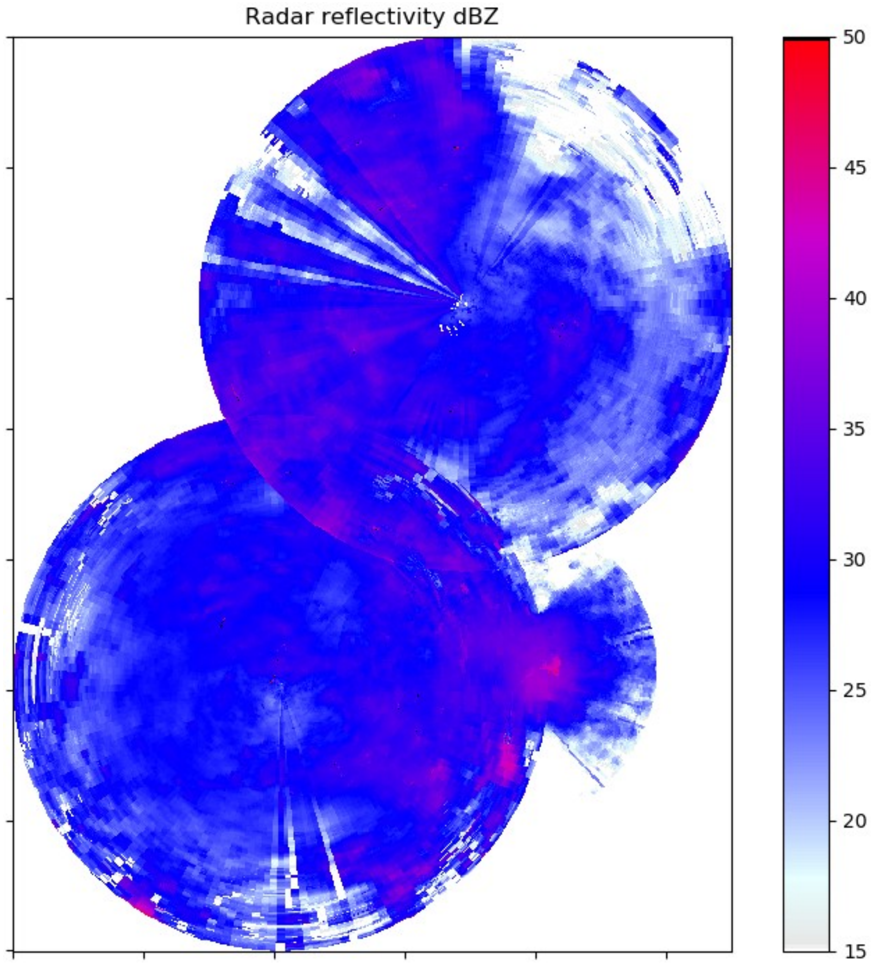


Results: First Radar precipitation map for Ecuador



Annual total 2014 – 2018 from rain gauge network

mm

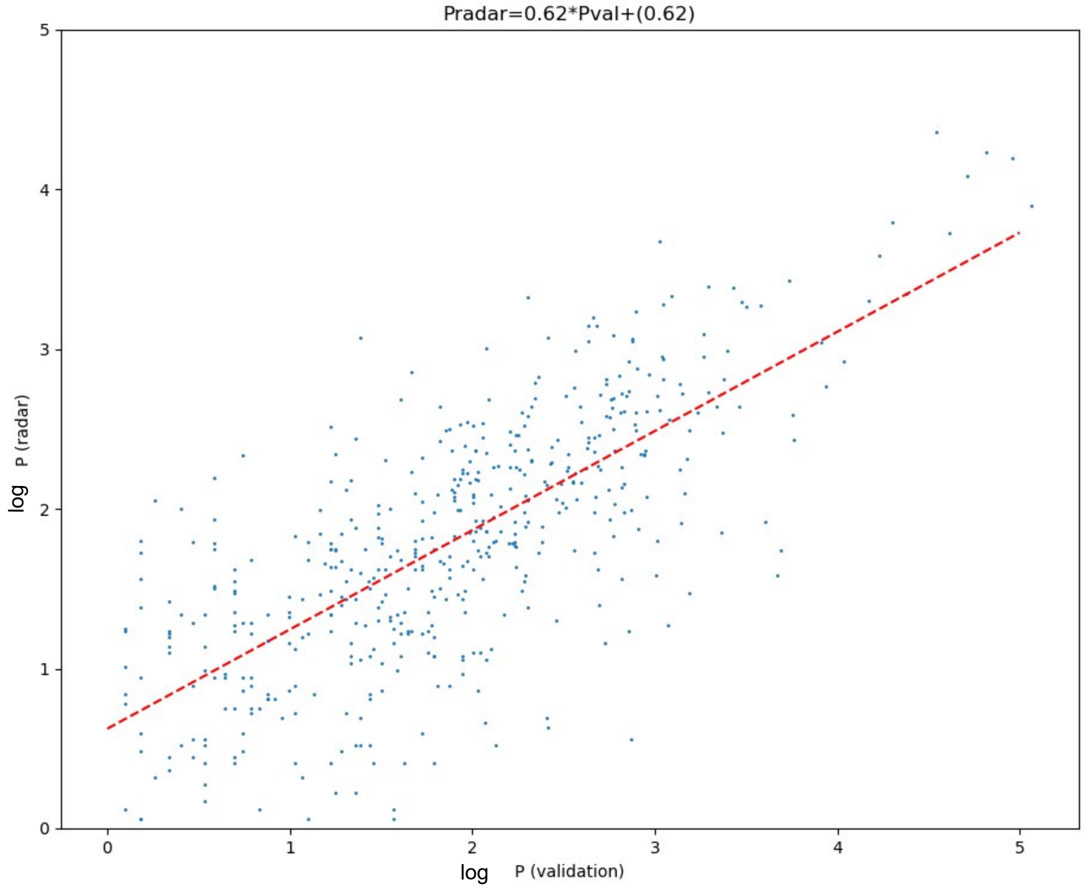


Mean Radar reflectivity 2014 -2018

mm

Maps cover the area of the first three Radars shown in the previous slide (LOXX, CAXX, GUAXX

Results: Validation



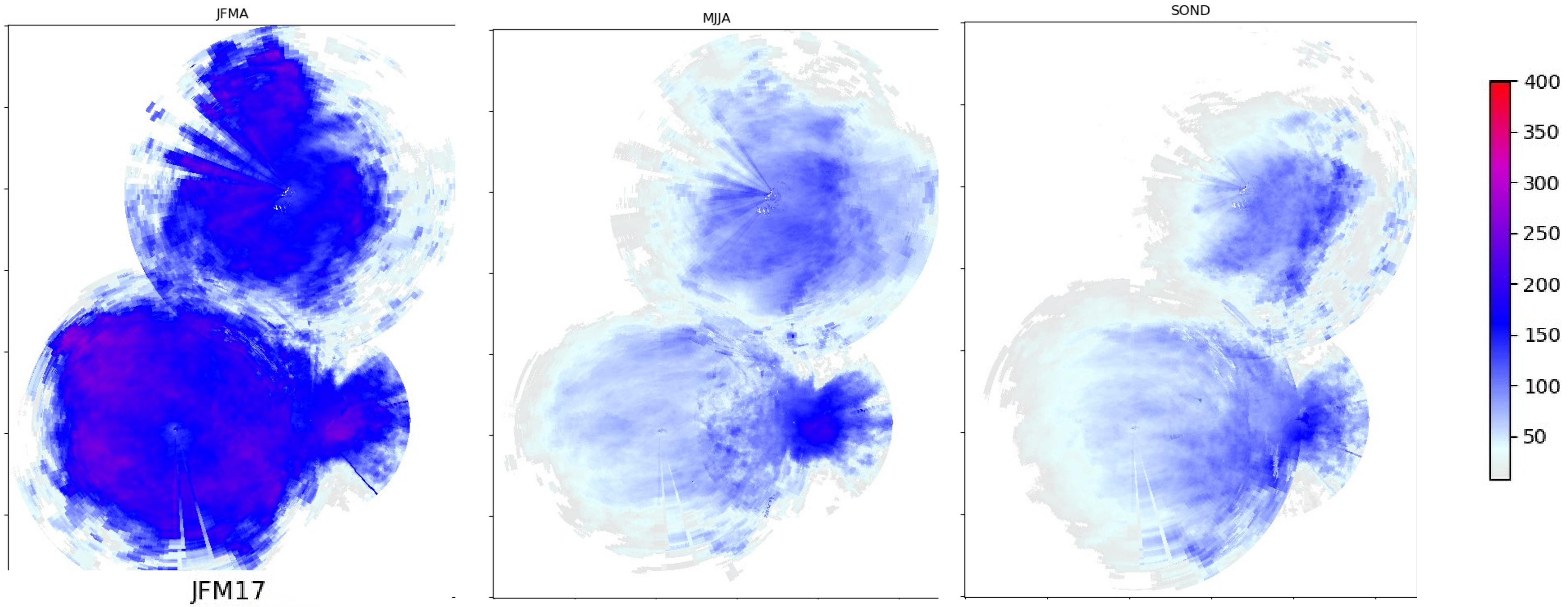
The validation shows a slight under– estimation, most likely caused by missing radar data due to operational interruptions.

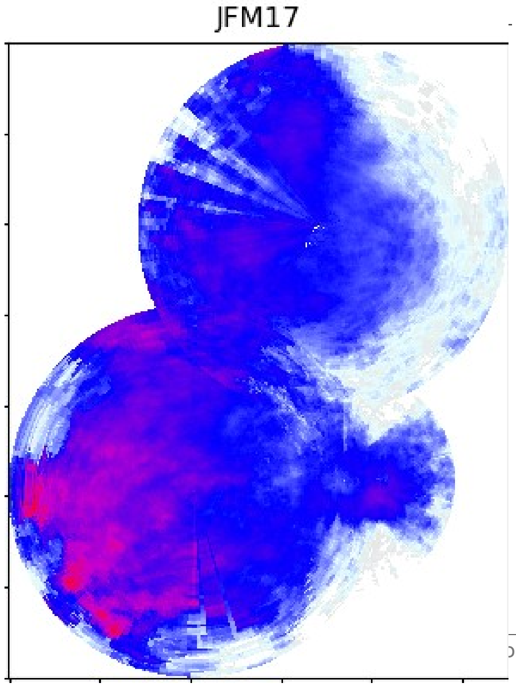
The overall fit is quite good with R = 0.73 at p=0.005

Double log plot of validation leaving out 10% of the rain gauges.

Radar derived QPE*: Seasonal maps 2014 - 2016

* quantitative precipitation estimate





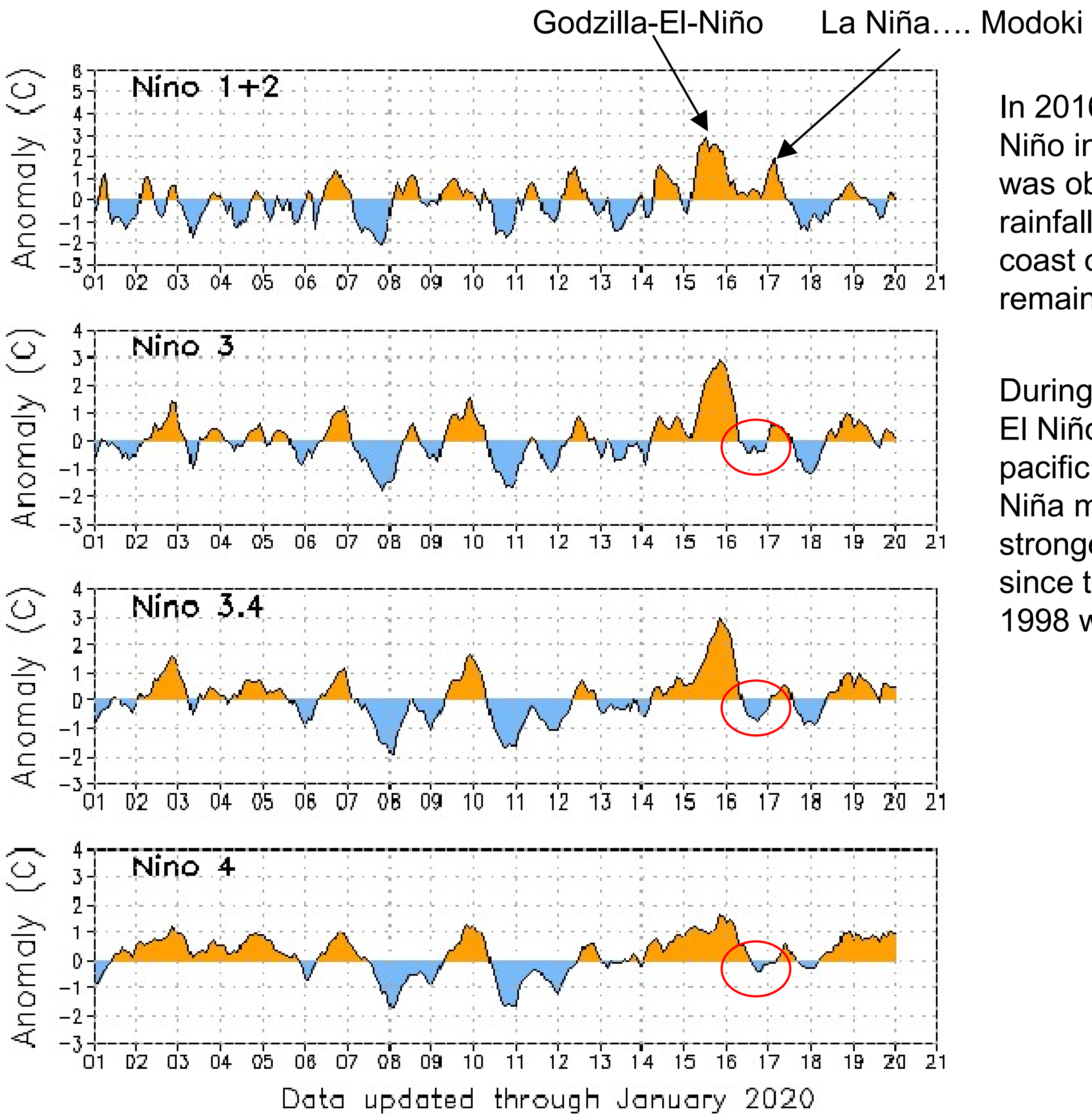
The upper three images show the normal annual cycle, but already include a heavy coastal rain episode in 2015.

Below left, the QPE for only three months of 2017 is shown (in April no data were recorded).

Apparently, the 2017 episode exceeded the normal rainfall during JFMA by a factor of up to 200%.

Widespread floodings were observed, especially in the arid zones of south-west Ecuador and the north of Peru.

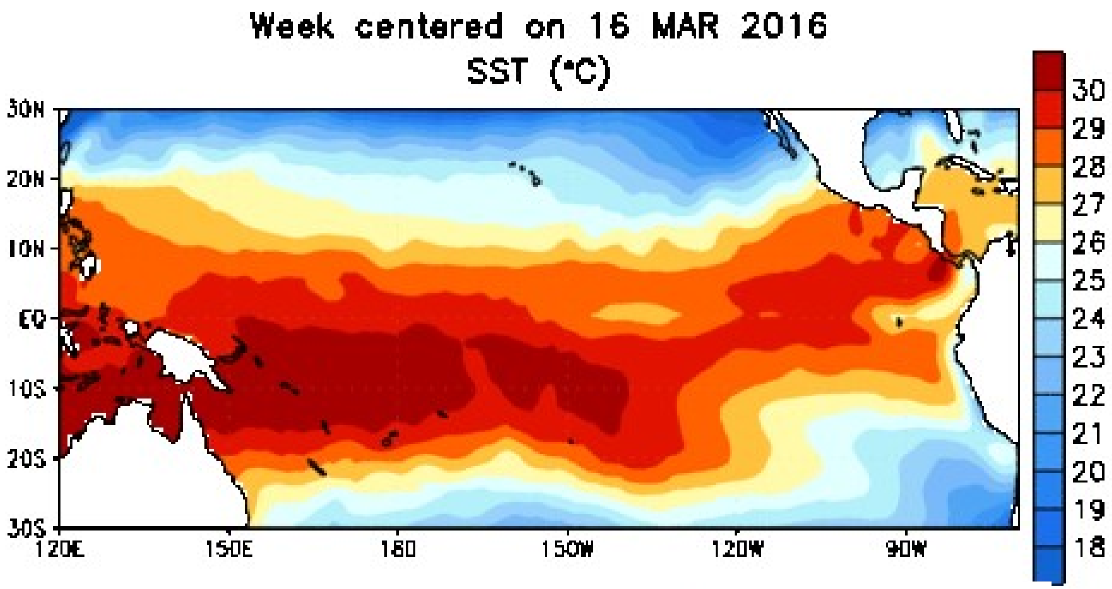
SOI

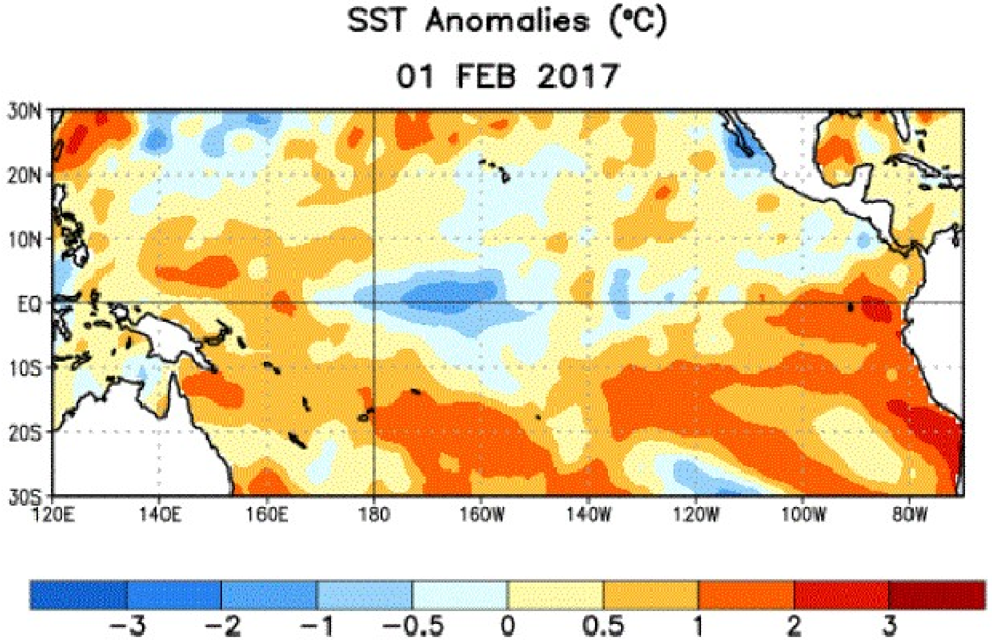


In 2016 a very strong El Niño in the central pacific was observed. However, rainfall on the pacific coast of Ecuador remained normal.

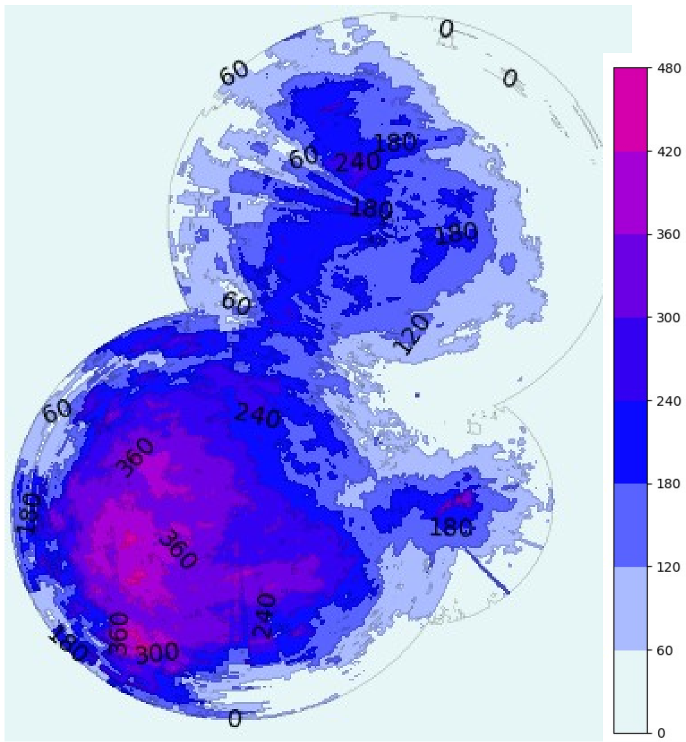
During the 2017 coastal El Niño 2017, the central pacific remained in La Niña mode – but the strongest rainfall anomaly since the Super-El-Niño 1998 was observed.

SST 2016 vs. 2017





Normal monthly rainfall in JFM 2017 was exceeded by up to 480 mm in some locations



conclusions

- our understanding of the local and regionan expression of ENSO is limited

- existing indices of ENSO are not capable of diagnosing the local impact

- The coastal area of Ecuador and Peru are mainly affected by warming of the Niño 1 +2 regions; The behaviour of the Central pacific is not that relevant

- Radar depicts the impact of such episodes with much better granularity and thus is more appropriate for understanding the synoptic development of such episodes and interaction with local land surface characteristics like topography and proximity to source areas of atmospheric moisture

Outlook

-Temporal dynamics are currently analysed, but not shown here due to the limitations of this presentation form

- Further work will also focus on small scale variabilty and local processes like mountain-valley- and land-sea-breeze.

- The influence of synoptical conditions will be adressed using satellite data and reanalysis products