Site characterization Chile



The history

- Weather station at Armazones site
- Weather station at Armazones 2k in February 2015
- Additional work: ASC etc, 30 meter tower in November 2015

Equipment on site

- 10 meter tower
- 30 meter tower
- ASC, photometer, seismometer





Network at the Armazones 2k site



Amount of data

- Weather from 10 meter station more than 820 days
- 30 meter tower 520 days
- ASC > 500days
- Photometer
- Seismometer ~ 336 days

Data completeness

- Failing battery at the 10 meter station.
- 30 meter tower working well, however need to manually get the data. (3s second data with gaps available earlier)
- Photometer taken for calibration and some measurements at the Auger site, now back.

10 meter tower data analysis

32 978 325 measurements every 2 seconds

Total of >760 days:

less than 820 because of data gaps.



Data gaps in 10 meter tower and also in conection to the site.

Temperature distribution



Temperature extremes



Temeprature extremes dark time



Humidity



Look here

Humidity extremes



All data

Humidity extremes dark time



Dark time

Wind distribution



Wind extremes



Wind extreme dark time



30 meter tower data analysis

- Three anemometers at 10, 20 30 meter
- 3d wind information
- Installed Nov 2015
- Data taken every 1 sec.
- Need to download data manually
- Currently we have 540 days of data, from 24 Feb 2016 till 16 August 2017
- 46331648 measurements sometime a few sec mssing from a day file
- Some ~3 sec data available as well.

Wind speed horizontal



Seems stronger than the average returned by the Reinhardt station 50 meters away.

Wind speed vertical



Wind profile ratios @20m/@10m



Wind profile ratio @30/@10



Gusts versus average @10m



Gusts vs avrage @20m



Gusts vs Average @30m



Wind maximum limits



~23 m/s in 50 years

Wind gusts limit



~28m/s in 50 years

Wind direction

• Varies but primarily from NW during the day

• See all data



Wind – two towers



Thies wind @10 is 30% stronger than Reinhardt @10m

Checked for data on 2016-06-10

Usable time with clouds

- Look at weather when images are taken
- Choose dark time
- Check for all environmental requirements

All Sky Camera analysis

- 18546 images so far since Nov 2015
- Take at night every ~730s
- Some data unusable because of the web cameras IR light
- Now corrected (with a tape)



ASC analysis



Thanks to Dusan and Mirek

Cloudiness distribution



Usable time with clouds

- Wind loss in dark cloudless time 0.24%
- Lo hum loss in dark cloudless time 6.79%
- Hi hum loss in dark cloudless time 0.25%

- Dark cloudless good time 86,69%
- Dark cloudless good time (low humidity ingored)- 93,35%

Mirror testing

- First round before the site decision, less than ear of data @ Armazones site
- Currently several mirrors @Armazones 2k since mid 2015, to be taken down and sent for measurements
- MST mirrors to be installed. Currently on site, waiting for installation by Vincente



Seismic studies



Seismic data

- So far we have 8081 hours (336 days) of data
- 125 Hz sampling, three axes
- Together about 170GB
- ~2000 quakes detected wih peak acc> 0.1cm/s^2
- Most of them are micro quakes

4.7 magnitude earthquake 30 km from Taltal, Antofagasta, Chile

10 months ago

UTC time: Tuesday, November 08, 2016 14:13 PM Your time: Tuesday, November 8 2016 3:13 PM Magnitude Type: mwr USGS page: M 4.7 - 30km E of Taltal, Chile USGS status: Reviewed by a seismologist Reports from the public: 0 people



Earthquake frequency distribution



Caution -preliminary results, based on on horizontal axis.

Conclusions

- Wind loss small, but need to understand the difference between 30m and 10m
- Principal problem is low humidity
- Losses to clouds ~7%
- Wind profile is very flat
- Very little turbulence. Can we increase the obs wind limit?
- Expect a "1m/s" earthquake every decade (~0.3g)
- Exoect a "few m/s" earthquake in 30 years (~1g)
- Web cameras have been failing. Is it a low humidity problem?

Next steps

- What to do next with the equipment
- Keep it there and continue taking data...
- Move something to the center of the array ?

- More mirror studies?
- If so which location?

