COCONet and TLALOCNet: Providing the Intra-Americas Seas Region with Enhance Atmospheric Observational Capacity

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What are COCONet and TLALOCNet?

- **COCONet**: Continuously Operating Caribbean Observational Network.
- **TLALOCNet**: Trans-boundary Land and Atmosphere Long-term Observational and Collaborative Network. Named after the Aztec God of rain, fertility, and water.
- Both are multidisciplinary research project focused on improving our understanding and ability to prepare for and predict natural hazards in region.
  - Natural hazards – basic geo-dynamic + atm-dynamic processes
  - Earthquake hazards, tectonic deformation, climate variability, severe weather
  - Provide data and data products through a shared and open process (advancing this concept throughout the region).
  - Provide “synoptic-scale” observations to support multiple research efforts.
  - Build capacity – develop international partnerships
COCONet and TLALOCNet Network

COCONet:
75 new/refurbished
9 remaining

TLALOCNet:
12 new/refurbished
12 remaining

Regional data centers:
Mexico (UNAM),
Nicaragua (INETER),
Barbados (CIMH),
Colombia (SGC)
Example Stations

Station: CN28
Location: Panama
Installed: 2012

Station: CN11
Location: Jamaica
(Pedro Cay)
Installed: 2011

Station: CN18
Location: Honduras
(Swan Island)
Installed: 2014
## Specifications of Met Sensor

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>±0.5 hPa at 0...+30 °C (+32...+86 °F)</td>
</tr>
<tr>
<td>Temperature</td>
<td>±0.3 °C (±0.5 °F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>±3 %RH within 0...90 %RH</td>
</tr>
<tr>
<td></td>
<td>±5 %RH within 90...100 %RH</td>
</tr>
<tr>
<td>Winds (u,v)</td>
<td>±0.3 m/s or ±2% whichever is greater</td>
</tr>
<tr>
<td>Rain</td>
<td>5%* (*does not account for wind induced error)</td>
</tr>
</tbody>
</table>
Performance of WXT Precipitation Sensor

Corrosion Problems in Some Locations

Photos courtesy of J. Sandru, J. Normandeau, and Vaisala
Suominet/COCONet PW
COCONet PW and Model Analysis PW

**GFS Analysis**

- Equation: $y = 0.84 \times + 7.35$
- Correlation: $r = 0.94$
- Mean Bias: $-0.73$
- Standard Deviation: $3.81$

**ERA-Interim Analysis**

- Equation: $y = 0.85 \times + 6.29$
- Correlation: $r = 0.92$
- Mean Bias: $-0.31$
- Standard Deviation: $4.19$

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**Coastal Oceanography and Meteorology**

**Constellation Observing System for Meteorology, Ionosphere, and Climate**

**COCONet – TLALOCNet – IASCLIP**
GPS and GFS PW Distribution

201310_000

201310_120

201310_240

201409_000

201409_120

201409_240

Count

PW (mm)

GPS and GFS PW Distribution
PW Differences (Bias and RMS) vs FCST Length

201310

201401

201409

PW Error (mm)

Forecast Hour

0 24 48 72 96 120 144 168 192 216 240

0 24 48 72 96 120 144 168 192 216 240

0 24 48 72 96 120 144 168 192 216 240

0 24 48 72 96 120 144 168 192 216 240

PW Error (mm)

Forecast Hour

Forecast Hour

Forecast Hour

Forecast Hour
SST and PWV Across Caribbean

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Constellation Observing System for Meteorology, Ionosphere, and Climate
Regression of PW to SST
Removal of Seasonal Signals

GRE0

BDOS

Constellation Observing System for Meteorology, Ionosphere, and Climate

COCONet – TLALOCNet - IASCLIP
SST and PWV Across Caribbean

CRO1

PW Anom (mm)

PW (mm)

SST Anom (C)

SST (C)

Year

Correlation

Num Sta

0.0 0.2 0.4 0.6 0.8 1.0

0 2 4 6 8 10

Correlation

Num Sta

0.0 0.2 0.4 0.6 0.8 1.0

0 2 4 6 8 10

CRO1

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Data Access and Availability

• All atmospheric data products related to COCONet and TLALOCNet are available through Suominet project within the UCAR/COSMIC program.

• PW and half hour mean of surface observations are available in either ascii or netCDF format.

• Data can be accessed with LDM or through the web interface.
  – LDM Data Stream, http://www.unidata.ucar.edu/software/ldm, Primary name = GPS, Feedtype = FT18
  – http://www.suominet.ucar.edu/data.html

• Hourly updates of raw (5 minute) surface meteorology data are available on NOAA GTS under data type SXCA51 (http://weather.noaa.gov/pub/data/raw/sx/sxca51.kwbc..txt)
Summary

• Data from COCONet project now have a record of sufficient length so that they can be used for both process and model evaluation studies.

• The comparison of GPS PW to analysis fields (GFS) reveal two primary features
  – Model analysis fields appear to wet for PW values <40 mm
  – Model analysis transitions to a dry bias for PW values > 40 mm

• PW fields within GFS forecast output extending out to 240 hours have been evaluated with COCONet PW.
  – Model rms error generally grows from ~3-4mm to almost 8-10 mm
  – GFS PW tends to be more homogenous from the analysis, extending through the forecast.

• From an annual view, SST and PW are highly correlated

• An anomaly analysis reveals that the majority of the SST/PW correlation is related to the seasonal variability in both data sets.
  – Things such as the persistent zonal flow and CLLJ act to quickly transport moisture

• Need to extend this analysis to evaluate parcels of air that pass across the Caribbean basin.
Collaborative Partners

Plus more than 25 international partners throughout Caribbean and Latin America