Bias Error Sources for Surface SW Radiant Flux (calculated - observed)

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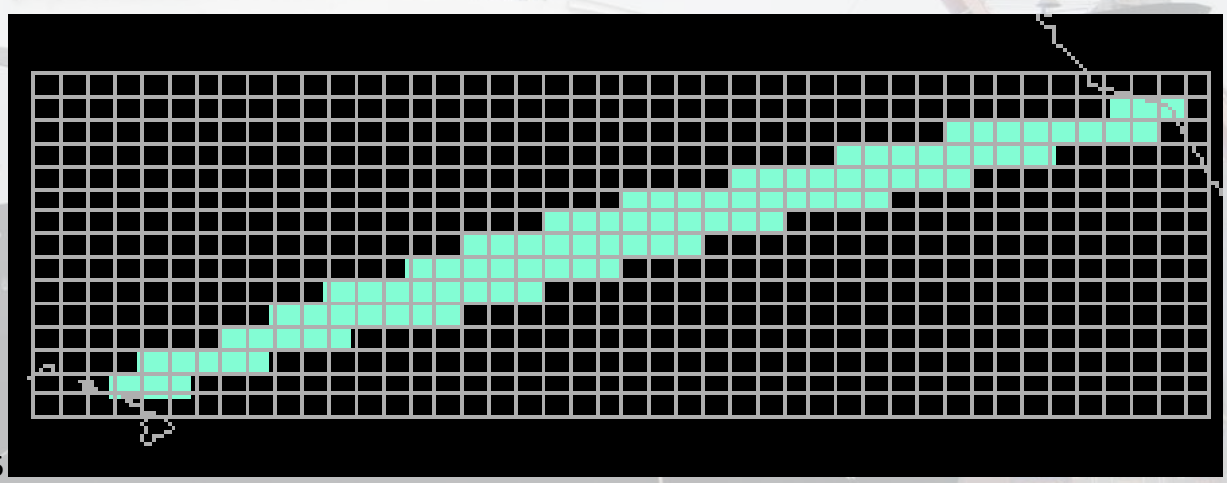
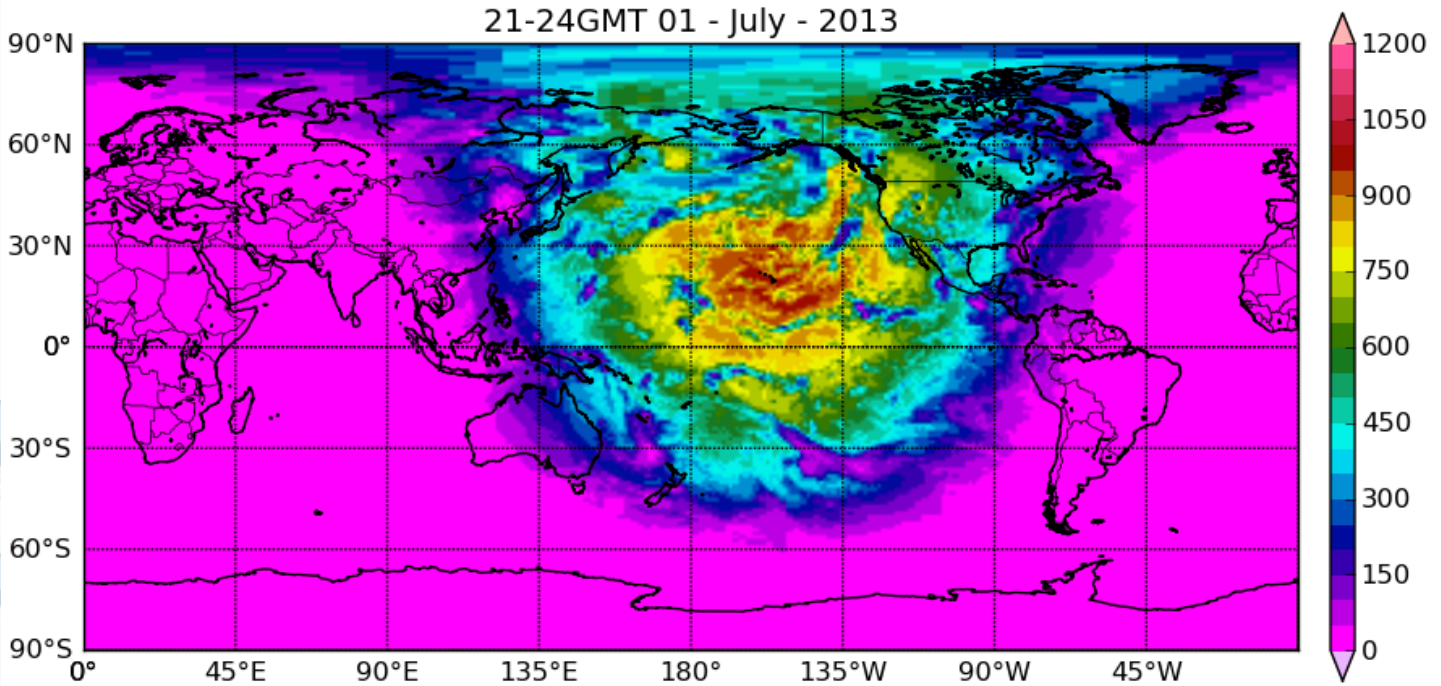
- Clouds & The Earth's Radiant Energy System (CERES)
- Long Term Climate Instrument (Terra, Aqua, Suomi-NPP)
- Retrieves 'Top of Atmosphere' SW & LW radiant flux
- One product: SYN1Deg (3 Hourly/Gridded/Global Flux Profiles)
- Compare 1 Hour Calculation for a Grid box vs MAGIC 1 hour average in that grid box.
- ceres.larc.nasa.gov

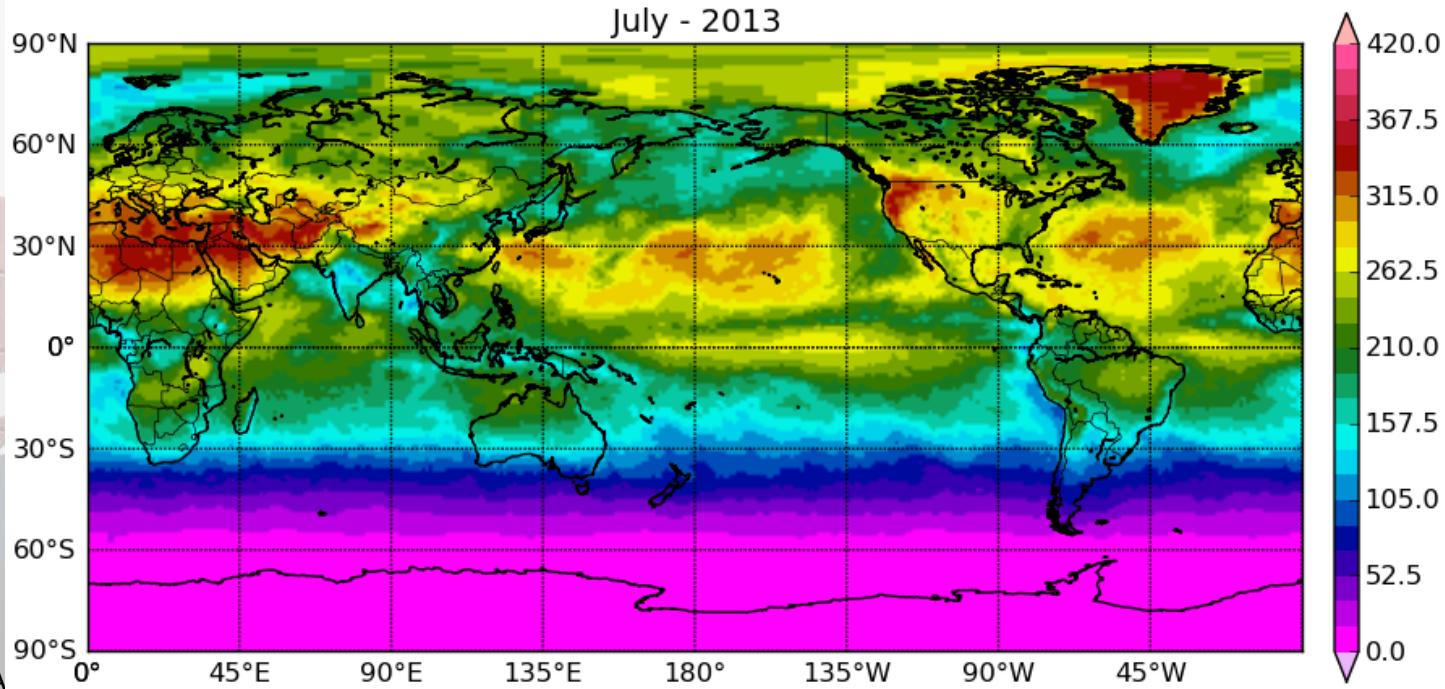


SW Radiant Flux Down at the Surface

3-Hour Average

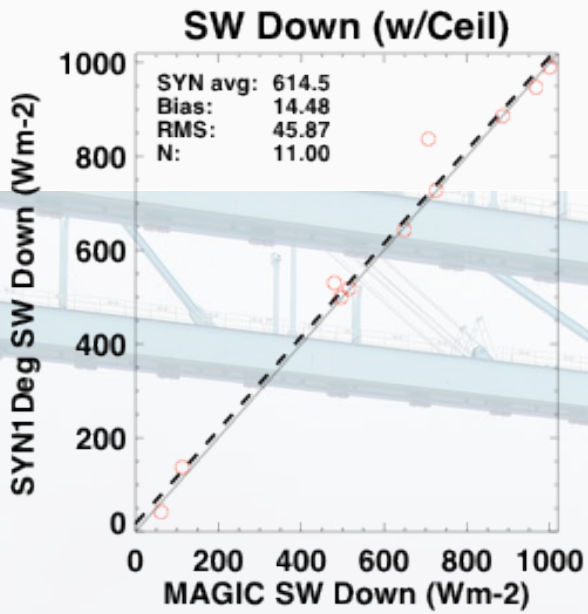


Monthly Mean

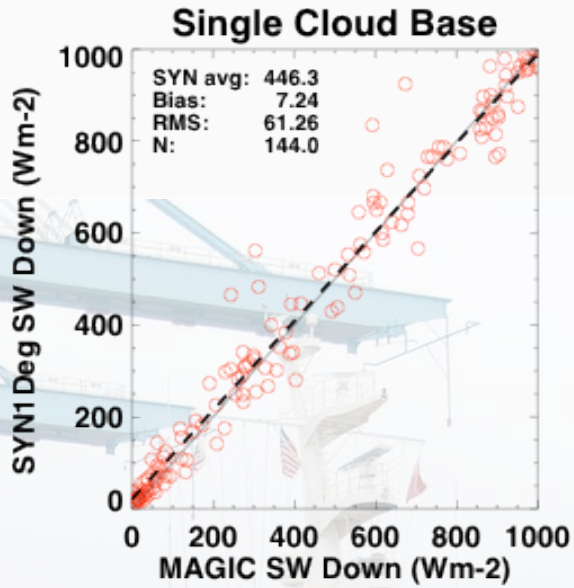


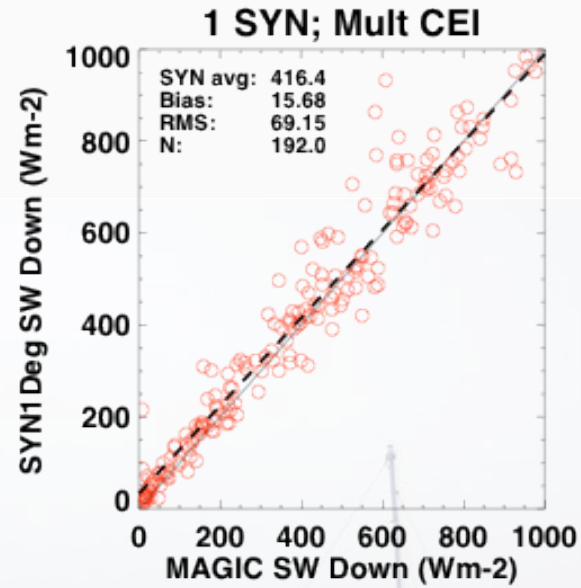
SW Down Comparison (SYN1Deg-MAGIC)

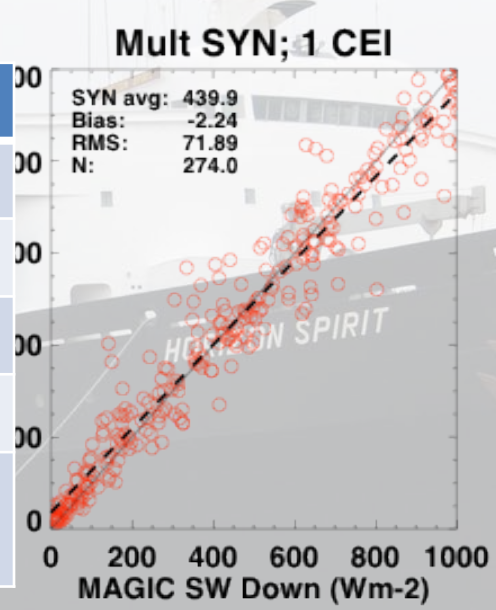
"Clear" Sky

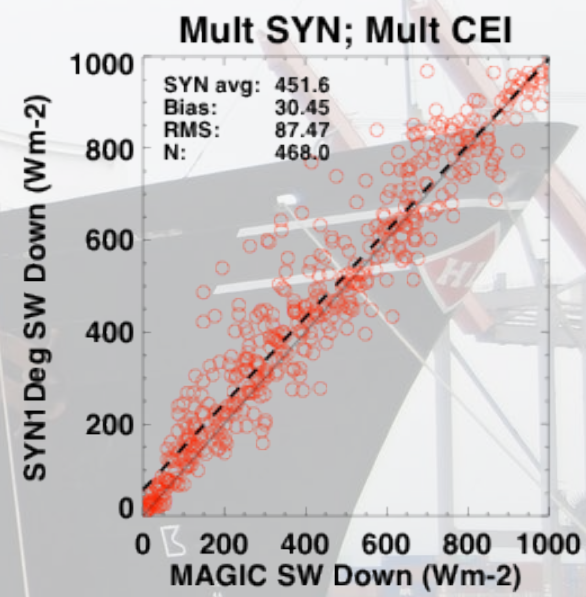


Cloudy Sky by Multi-level





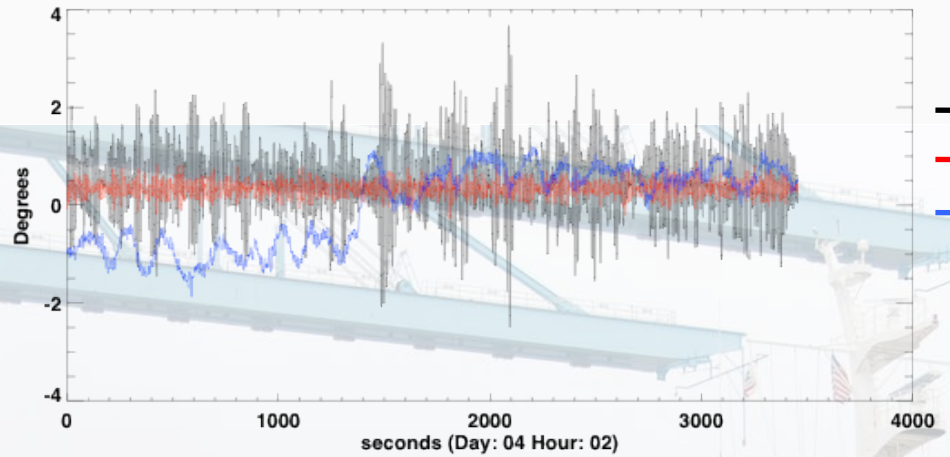




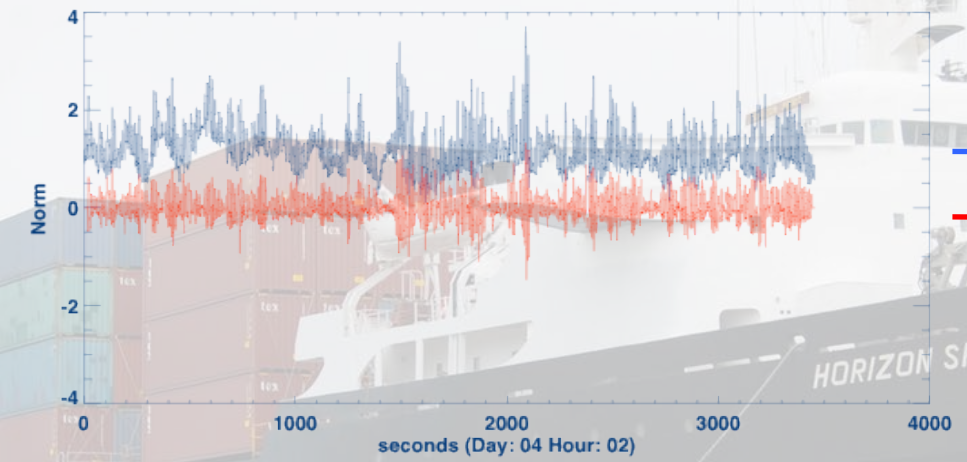
Scene	N	Bias	RMS
Clear	11	15	46
Single Base Both	144	7	61
1SYN; Mult Ceil	192	16	69
Mult SYN; 1Ceil	274	-2	72
Mult SYN; Mult Ceil	468	30	87

Ship Motion?

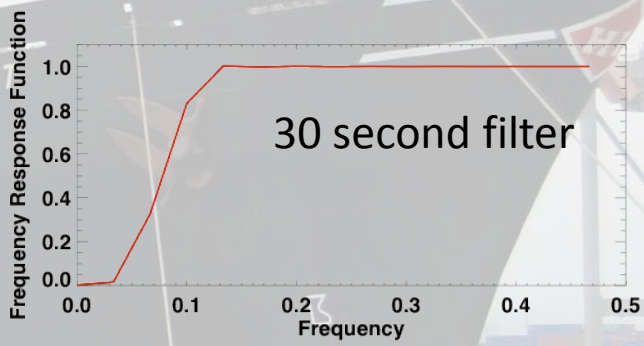
Original resolution (10Hz) sub-sampled to 1 second.

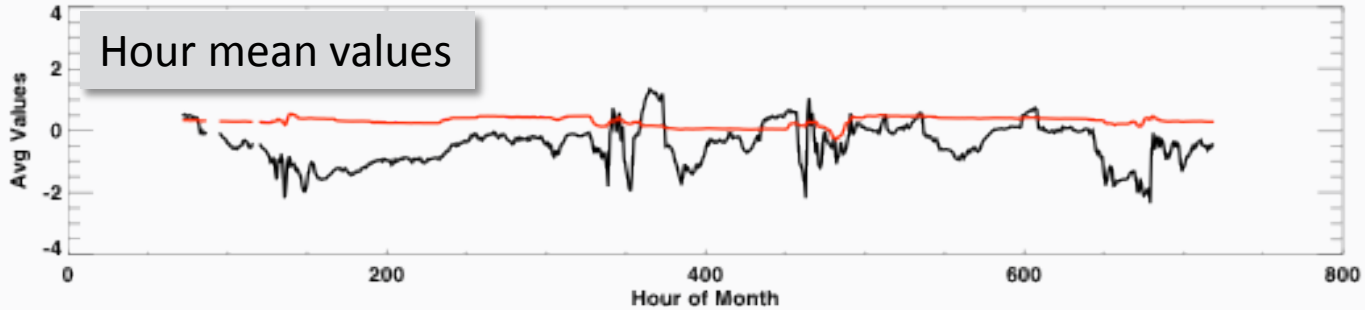


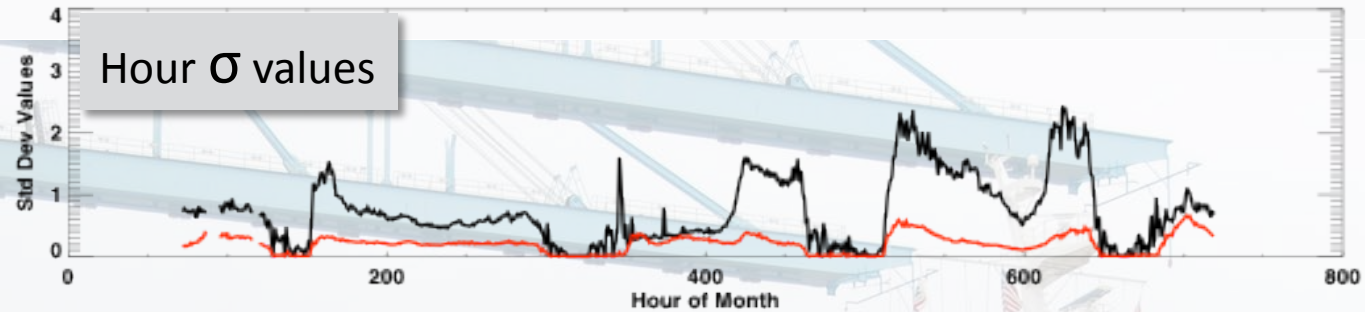
Roll
Pitch
Yaw (normalized)



Motion Measure ($\sqrt{r^2+p^2+y^2}$)
MM (with High Pass Filter)

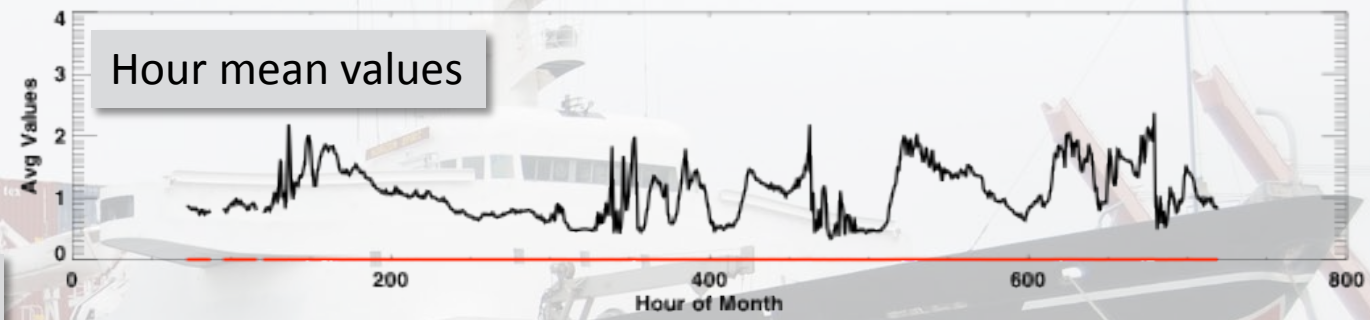






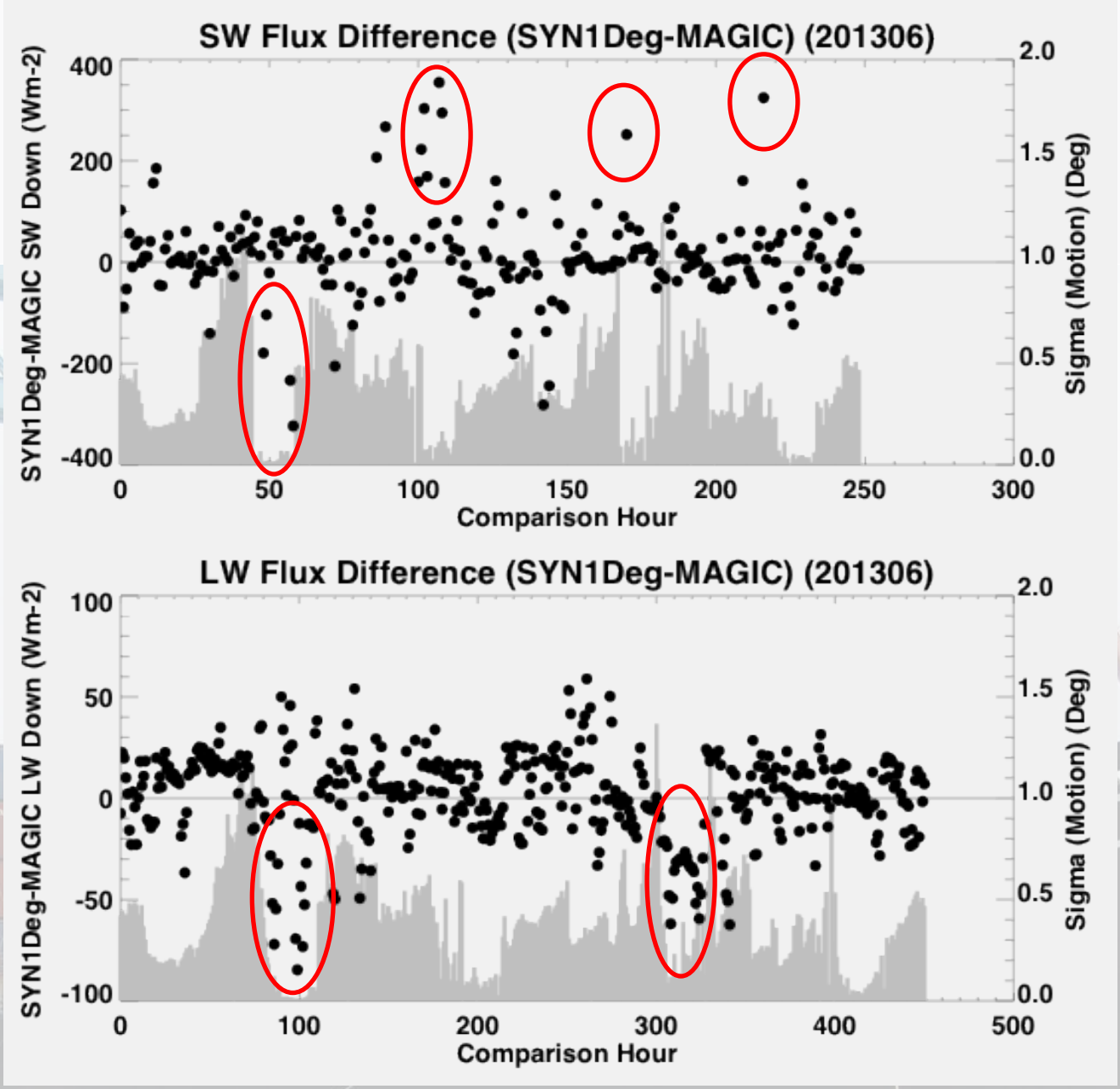
Roll
Pitch

Motion Measure ($\sqrt{r^2+p^2}$)

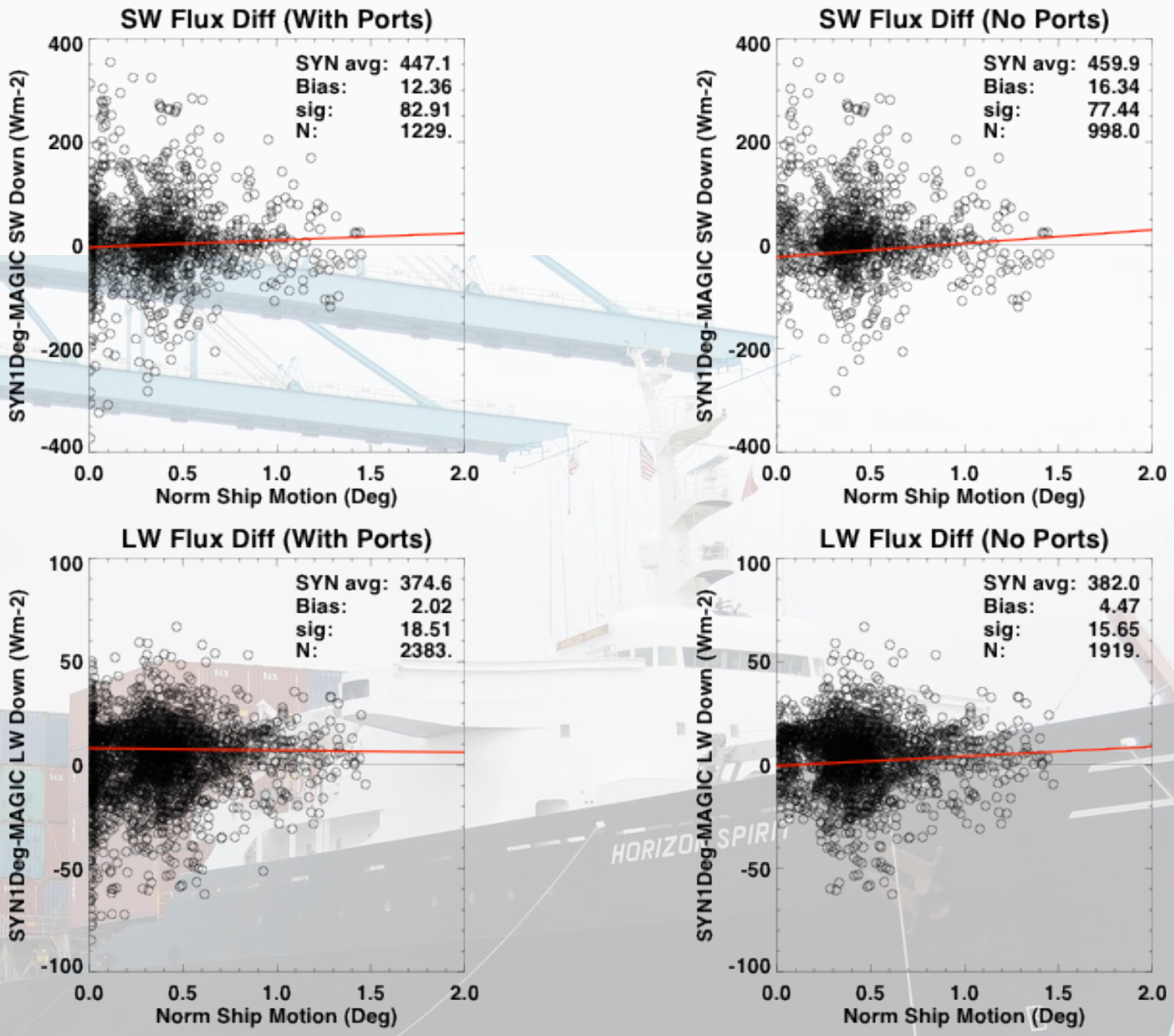


Unfiltered
Filtered

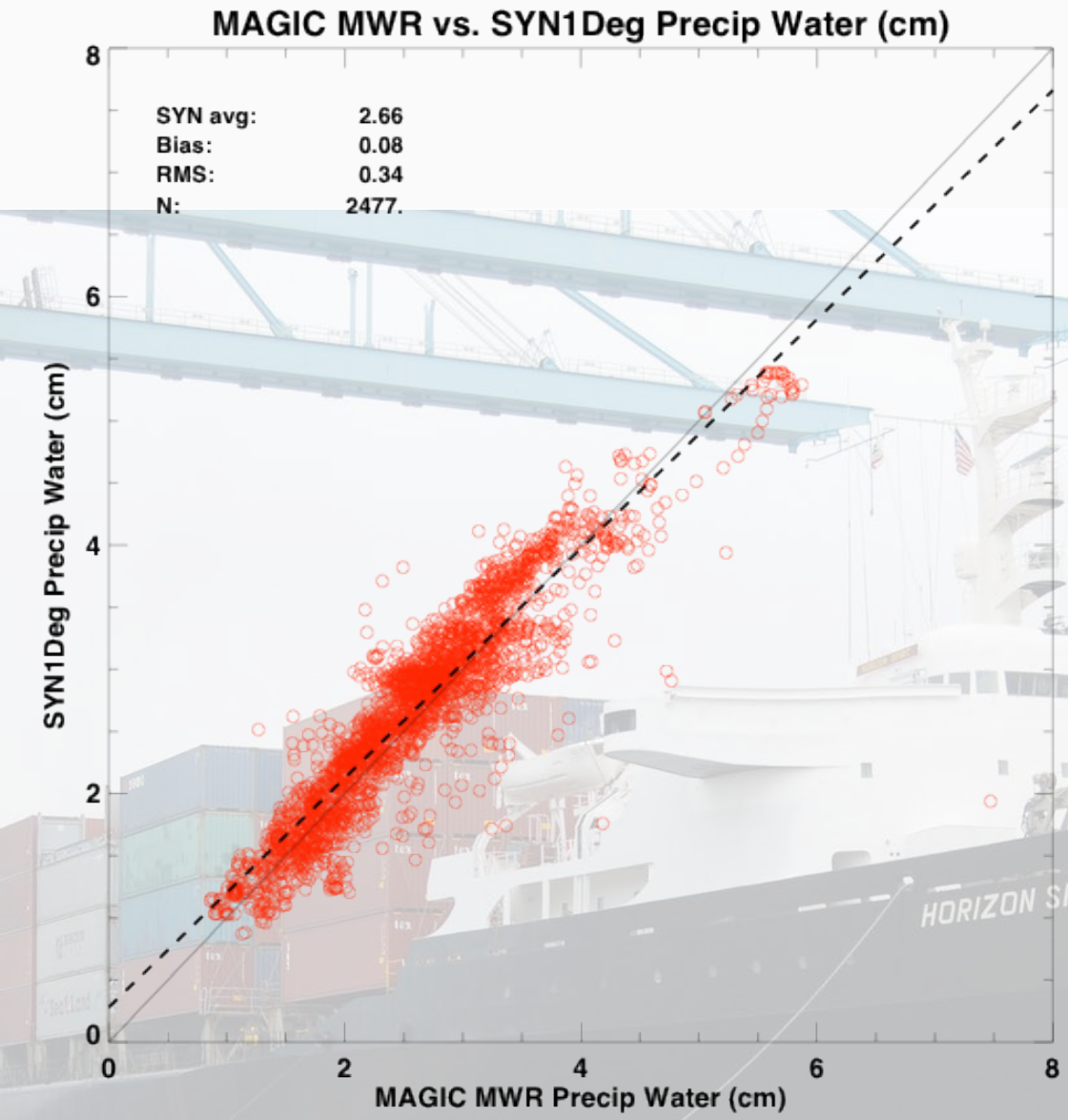
Plot Difference in (Calc – Observed) to Motion



Differences with and without ship in port.



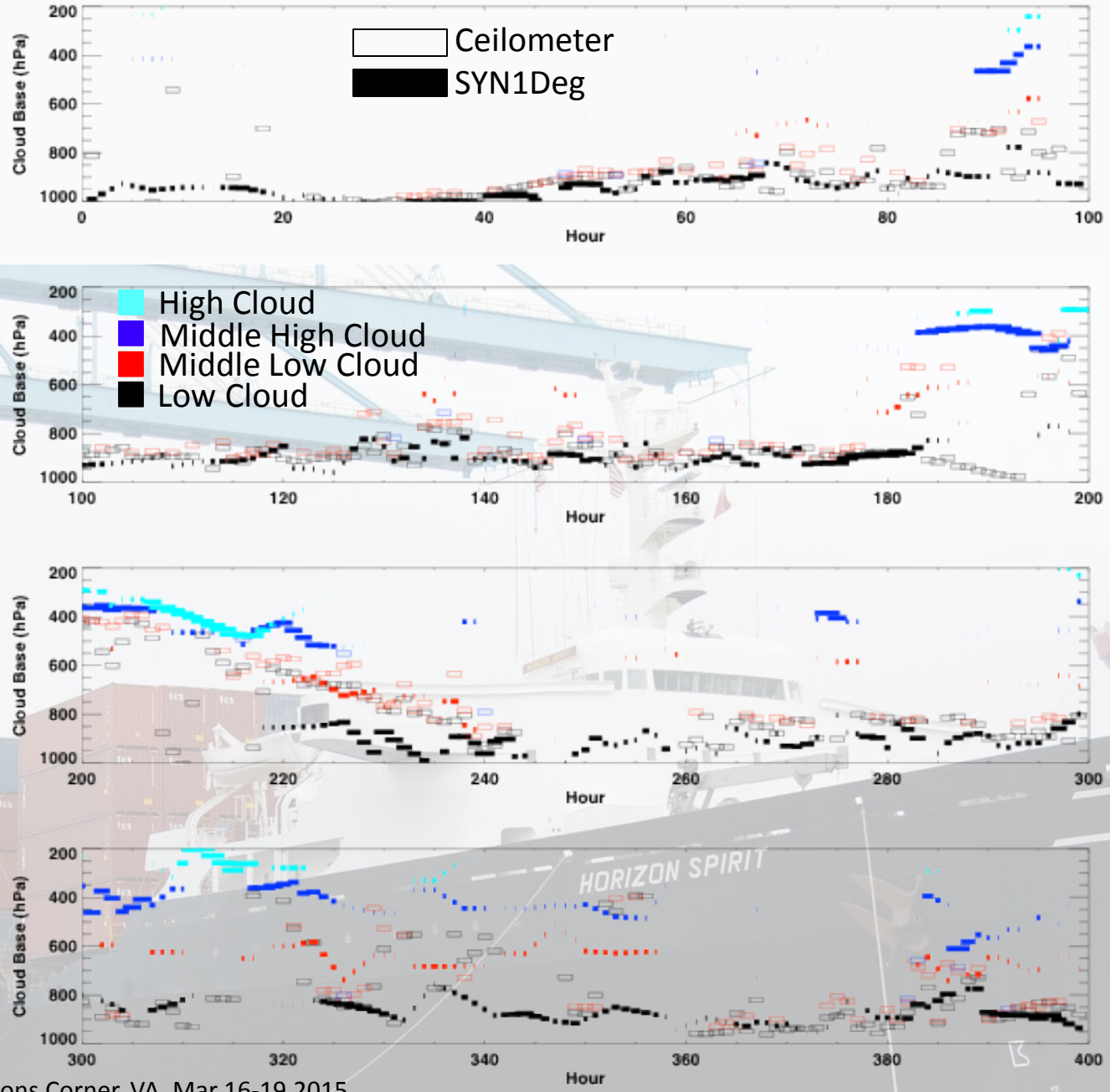
Precipitable Water?



3% High bias in PW

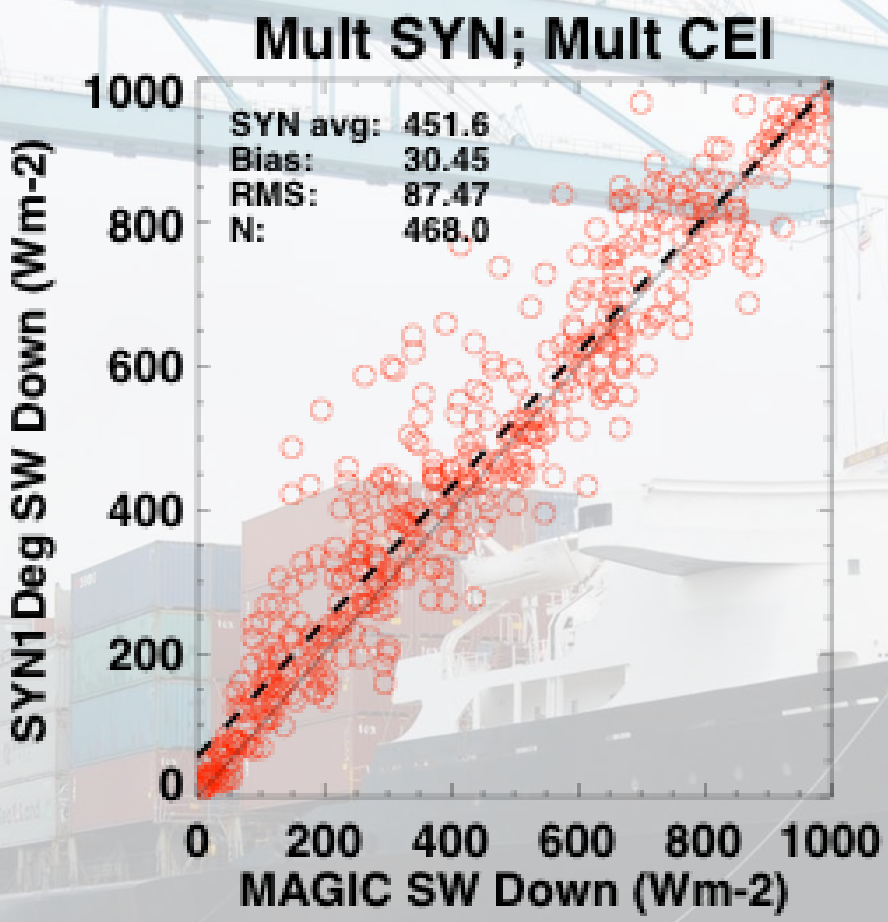
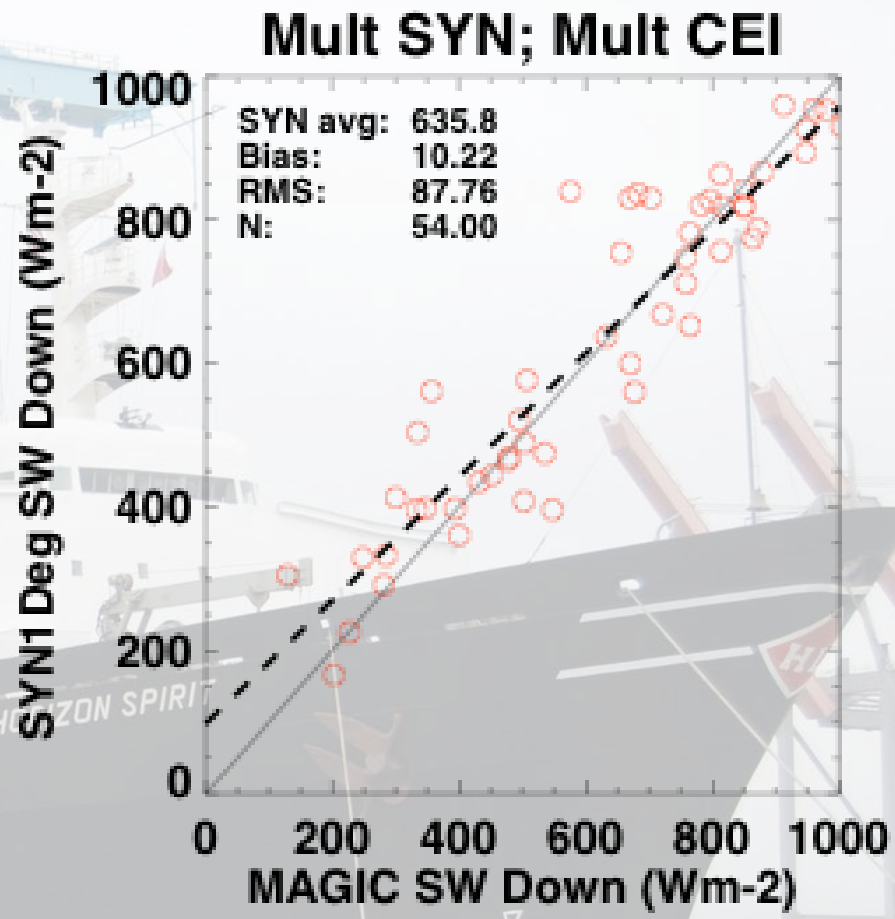
At μ_o=0.5 ~ 0.8 Wm^{-2}

Ceilometer Cloud Base & SYN1Deg Cloud Height/Fraction



Cloud Property Source?

Clouds From MODIS & GEO Imagers



Clouds From MODIS Only