MISR, ISCCP and MODIS simulators : current results and plans for AR5

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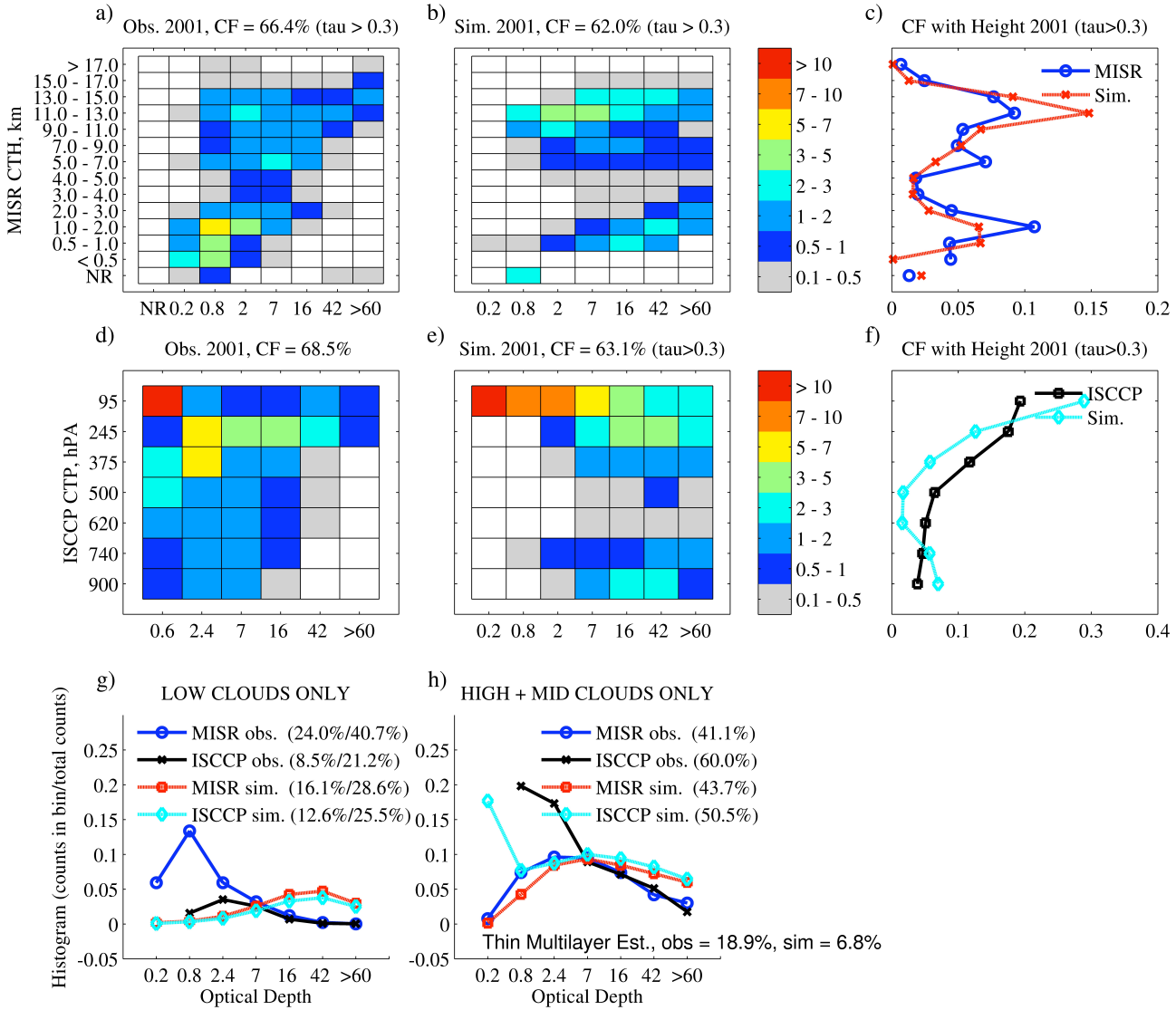
Outline

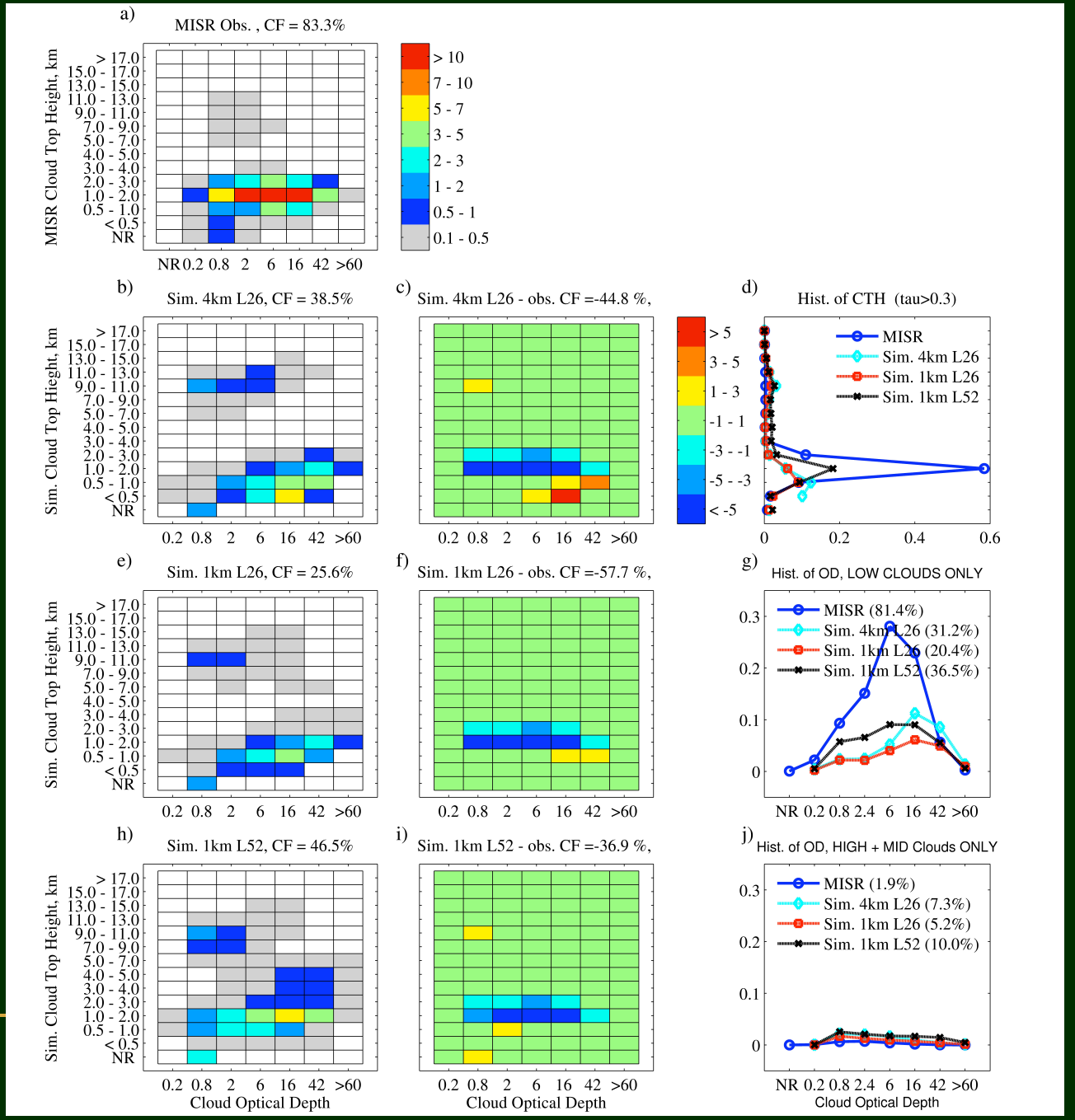
- Why bother using all of these simulator ?
- Discussion on cloud analysis activity

Comparison of MMF (4km) with ISSCP and MISR
Tropical Western Pacific, 2001



Comparison of MMF Simulations with differing CRM grid-spacing

South American Stratocumulus



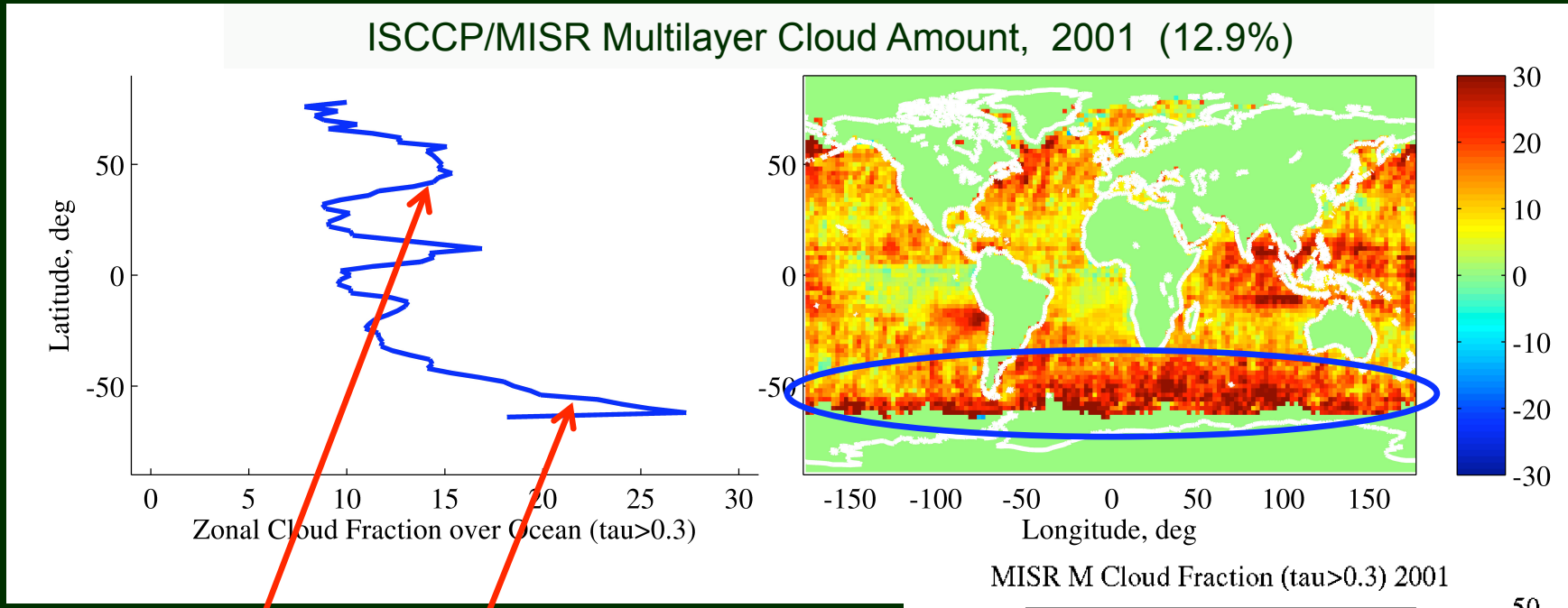
Why bother using all of these simulator ?

- Take advantage of the strengths of each dataset, for example,
  - MISR stereo provide better cloud-top-heights for low and mid-level cloud, as well as better detection of mid-level (water) clouds (esp. near tropical cloud near the freezing level). Currently (?) only available over land.
  - MODIS has greater sensitivity to optically thin, high altitude cloud, as well as provides information on effective radius and phase discrimination.
  - ISSCP provides information on diurnal cycle and longer data record.

- Used together ISCCP & MISR or MODIS & MISR can be used to estimate the amount of multilayer cloud (where the upper layer is optically thin tau < ~ 1 to 2).

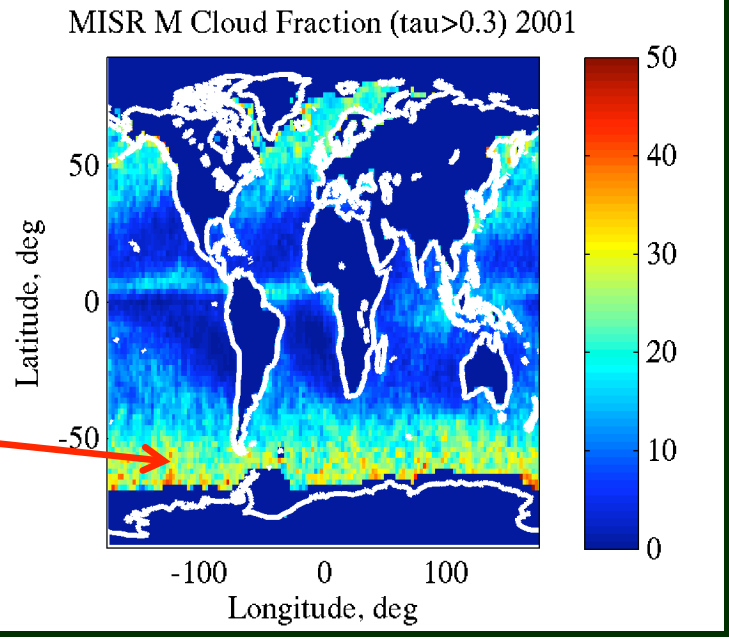
- With regard to total cloud amount (cloud-top at any altitude), the differences between the dataset provide a crude-estimate of the uncertainty (or at least warn where algorithm details are important).

Multilayer Cloud Amount



More multi-layer cloud in southern hemisphere beyond 50° S

So some of the ISCCP "mid-level" here is not real … which is not say there isn't ALSO more mid-level cloud in SH than NH.



A group cloud analysis project ?”

- “Roger Marchand has offered to lead an analysis activity using the MISR, MODIS and ISCCP simulators. Nominally, this would mean running these simulators and exchanging output for the year 2008 for experiments 3.3 (AMIP), 6.5 (AMIP + 4CO2, fixed SST) , 6.6 (AMIP+SST pattern change) and 6.8 (AMIP+4K). Would you be interested in participating in this activity ?”

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Extra slides …

"Best Practice" Comparisons

Total Cloud Cover

tau > 0.3 (ISCCP and MISR; trade/broken cloud issues, MOD08 has cloud-edge issue)

tau > 9.4 (MODIS and MISR; ISCCP OD distribution is biased slightly low)

Low Cloud Cover

tau > 0.3 (MISR and ISCCP, trade/broken cloud issues)

tau > 9.4 (MODIS and MISR)

High + Mid-Level Cloud Cover

tau > 0.3 (ISCCP and MISR; difference == Multilayer (ML) clouds).

tau > 9.4 (MODIS and MISR; difference == Multilayer clouds).

High Cloud Cover

tau > 1.3 (MODIS and ISCCP ?)

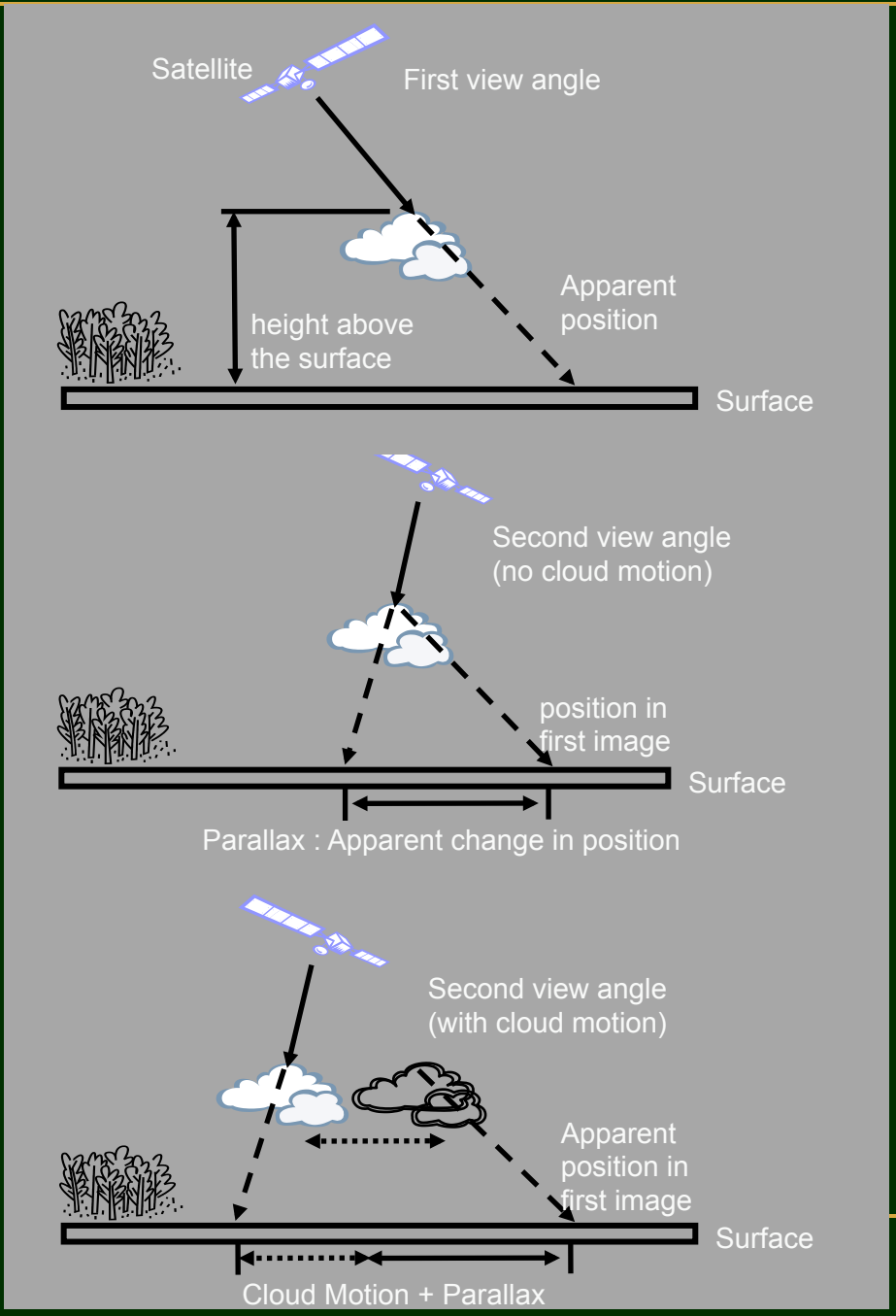
tau > 9.4 (MODIS and ISSCP or MISR – best choice may depend on region)

Mid-Level Cloud

tau > 1.3 ? (MODIS and MISR)

tau > 9.4 (MODIS and MISR)

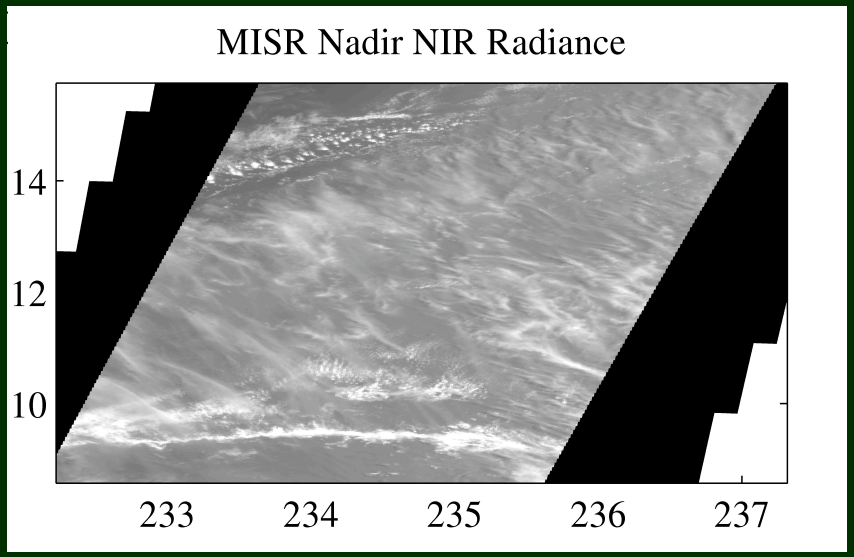
- Global ocean-only and land-only (no-MISR)
- Regional Analysis (NP, TWP, Cal-SC, SA-SC, etc.) ➔ look more carefully at distributions
- Links to radiation, precipitation, etc …

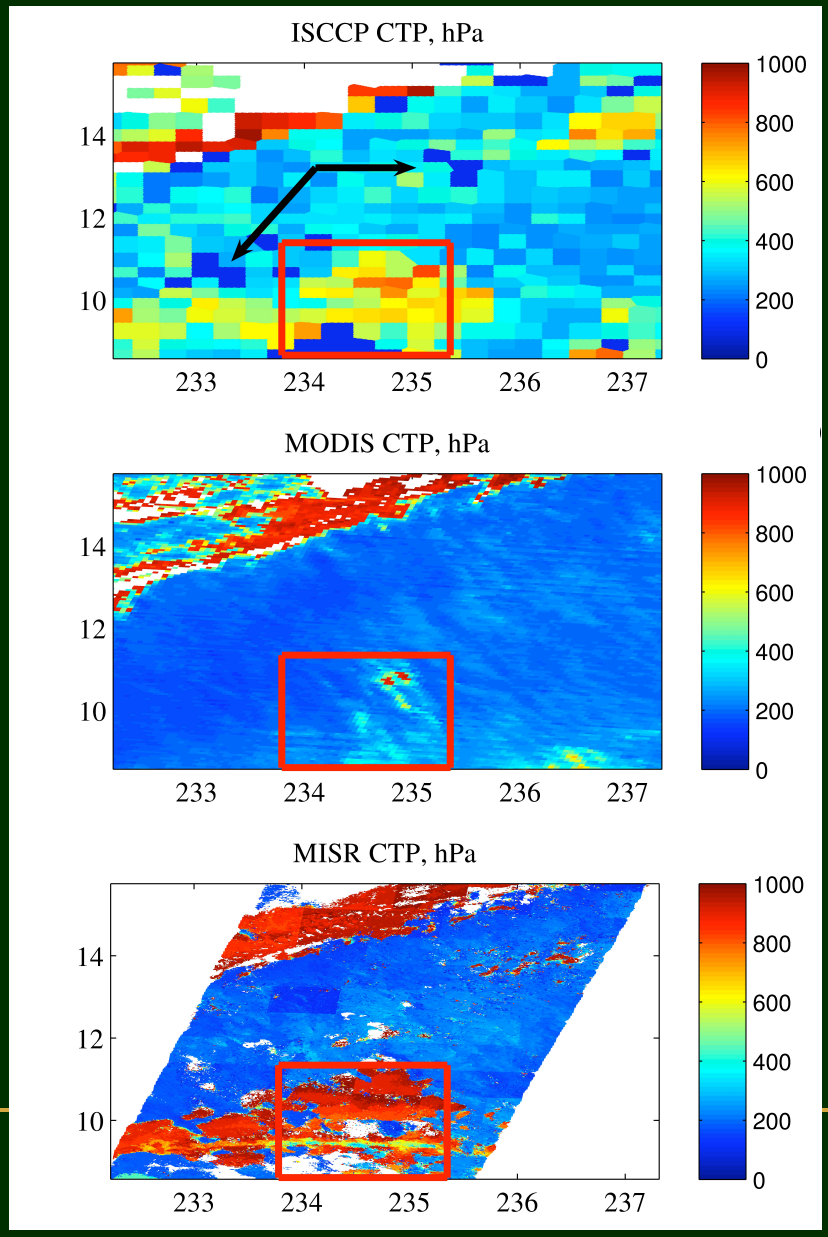


Stereo-imaging

- A significant advantage of the MISR CTH retrieval is that the technique is purely geometric and has little sensitivity to the sensor calibration.
- The retrieval has been the focus of several studies including Marchand et al. (2007), Naud et al. (2002, 2004, and 2005a,b), Seiz et al. (2005), Marchand et al. (2001).

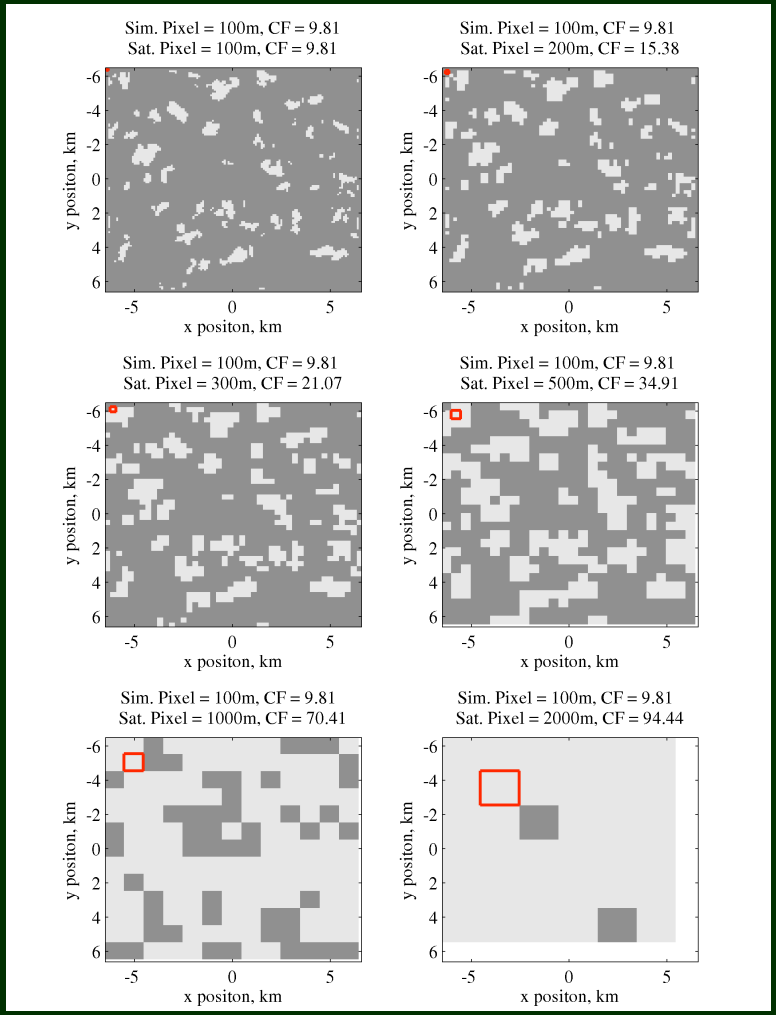
Why/how does multilayer estimate work ?

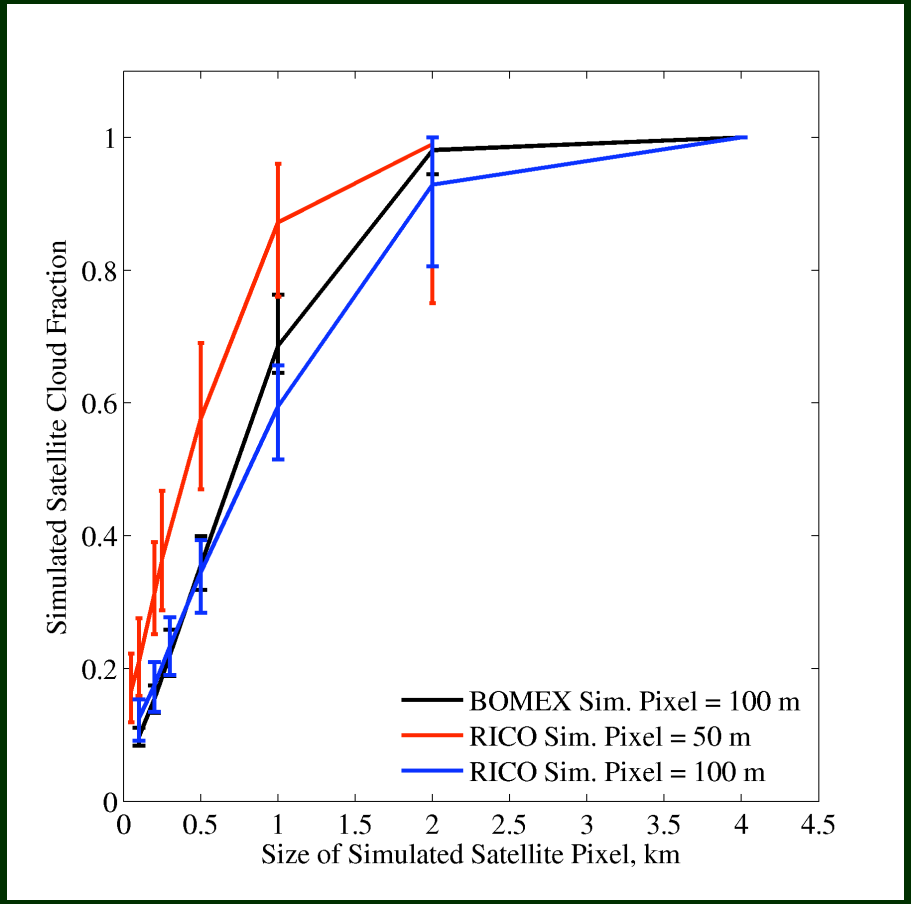




Sensor horizontal resolution matters

- Caveat: the COSP instrument simulators are quite simple codes … The effect of cloud-element-size is not included and can be important for LES/ high resolution models





Comparisons

- 1) Longwave Cloud Forcing (compared to CERES)

  2) Shortwave Cloud Forcing (compared to CERES)

  3) Total Cloud Cover tau> 0.3 (compared to BOTH ISCCP and MISR)

  4) Total Cloud Cover tau> 9.4 (compared to BOTH MODIS and MISR)

  4) Low Cloud Cover tau > 0.3 (compared to MISR ... perhaps Calipso too, need to review current algorithm ?)

  5) Low Cloud Cover tau > 9.4 (compared to BOTH MODIS and MISR)

  6) Mid-Level Cloud tau > 9.4 (compared to BOTH MODIS and MISR)

  7) High Cloud Cover tau > 1.3 (compared to MODIS and MISR ... not 100% sure where I would put this cutoff but not 0.3)

  8) High Cloud Cover tau > 9.4 (compared to BOTH MODIS and MISR)