The Assimilation of Satellite Observations for the U.S. Navy’s Operational Forecast Models

Nancy L. Baker¹, Clay Blankenship², Bill Campbell³, Rolf Langland⁴, Steve Swadley²
¹Naval Research Laboratory, Monterey, CA
²METOC Consulting, Monterey, CA

NRL/FNMOC Forecast Suite

This corresponds to the Naval Research Laboratory, Monterey, CA.

AMSU-A Radiance Assimilation for NOGAPS and COAMPS

Approach: Assimilate radiances directly using NAVDAS

- Uses channels 4-11, screen land/ice/noir observations depending upon whether channels “sense” the surface
- Every 4th observation; additional thinning to remove overlapping observer satellites, final spacing ~ 150 km

- QC removes sporadic bad data, and radiances affected by cloud liquid water, precipitation, surface ice or land

- Bias corrections are an essential component, modified Harris and Kelly approach

- Modifications to bias correction method led to excellent improvements in forecast skill and quality of the assimilated radiances

- Radiiances strengthen circulation in SH, better fit with radiosondes and other observations, improved tropical cyclone track predictions

Bias Correction Method

- Most weather centers (and correct) bias statistically via multiple linear regression, using either satellite radiance or NWP model variables as predictors.

- Any approach incurs the risk of either throwing out signal with bias, or not throwing out enough bias, although careful choice of time scales can mitigate this risk.

- NRL is investigating hybrid approaches, which use both satellite radiances and NWP model variables as bias predictors.

- These bias correction schemes are computed offline, using two weeks of data to determine regression coefficients, which are then applied to the next two weeks of data.

- Harris and Kelly (HK) method

- Global or latitude band regressions

- All NRL test predictors, plus radiances from all AMSU-A channels

- Highly effective and versatile, can be used for all types of data assimilation.

- Adapts easily to flow-dependent background errors

- Supports nested grids

- Lays the foundation for cycling representation algorithms

- Designed by Roger Daley with Edward Berk, Keith Seiburg, Patricia Pauley, James Coe, Nancy Baker, Tom Roosen, Bill Campbell, Clay Blankenship, Lung-Ya, Randal Paulay, Peter Stanile, Tom Longhoud

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