Assimilation for Sea Surface Skin Temperature in GEOS-DAS

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In the context of coupled atmosphere-ocean data assimilation, surface skin temperature (Ts) is an important variable for the calculation of air-sea fluxes and near-surface processes. A *bulk* retrieved-SST product is an inadequate representation of Ts, since it does not account for the near-surface ocean stratification, which is related to diurnal variations (solar insolation), wind stress and wave (surface currents) induced mixing.

We model Ts: (i) based on a *near-surface ocean temperature*- which has minimal contribution from diurnal effects, (ii) a diurnal warming model which takes into account the penetration of shortwave heat flux at the surface and turbulent diffusion effects [1], (iii) a cool-skin layer that is dominated by molecular diffusion of net longwave, latent and sensible heat fluxes within a few microns of the air-sea interface [2,3]. The assimilation for Ts is conducted using the Gridpoint Statistical Interpolation (co-developed with NCEP). The analysis includes a state vector representative of the entire atmosphere and Ts. Results and discussion will focus on assimilation of brightness temperatures (from AVHRR Channels 3B, 4 & 5). Emphasis will be on the statistics of observation-minus-background residuals and impact of assimilation on air-sea fluxes.

References

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[3] Fairall et al., ''Cool-skin and warm-layer effects on sea surface temperature,'' *Journal of Geophysical Research*, vol. 101, 1996.