Priorities for DA/ Ensemble strategic team(s)

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(in consultation with DA and Ensemble strategic teams)

1) DA System Development

- Develop a self-consistent 3D->4D EnsVar DA system using cycled HWRF backgrounds. This system will:
  - Use an HWRF-based EnKF to define background-error covariances.
  - Have a moving nest DA cycling capability.
  - Be able to use WRF/ARW, WRF/NMM-E and NMM-B dycores.
  - Assimilate all operational observations (including radiances and airborne TDR).
  - Have a flexible cycling interval (down to 1-h).
- This should be the highest priority, since most of the other priorities depend on this.

2) Systematic Evaluation of DA/Ob impacts

- Use self-consistent hourly cycling HWRF EnsVar system to evaluate impact of high-frequency (temporal and spatial) obs on vortex-scale. Observations to be evaluated include:
    - airborne data (including those data already tested in RDITT). Of particular interest is the impact of dropsondes, since NHC is interested in increasing the number of drops from Air Force recon flights.
    - Ground-based radar
    - Geostationary sat winds
    - GPSRO
    - Statistical retrievals from hyperspectral sounders
    - Radiances from geostationary platforms

3) DA research priorities

- dealing with displacement errors via
    - field alignment
    - rapid cycling
    - storm-relative DA
- Increase the use of radiances in clear *and* cloudy regions. A key aspect of this will be developing bias correction methods that work in limited domains and/or better leveraging the bias corrections derived from the global assimilation.
- Dealing with multi-scale sampling error (vortex-scale and environment).
- representation of model uncertainty (through the development of stochastic physics in HWRF, emphasis on microphysics/sfc layer) – also applicable to ensemble forecasts.

4) Ensemble forecast priorities

- evaluate HWRF ensembles initialized from EnsVar system vs those initialized from GEFS.

- Evaluate estimations of forecast uncertainty (at different spatial temporal scales) to inform development of stochastic physics.

- Extract more information/develop new products from days 5-7 in global ensembles (particularly relating to genesis/decay)

- Identify/correct deficiencies in ensemble system for days 5-7 (including storm population biases, track biases - feedback on model physics development)

- Evaluate the impact of using multiple models (HWRF, TC-COAMPS, WRF-ARW) within the ensemble.

- Include the effect of ocean uncertainty in ensembles.
  - Using coupled models (longer term) and atmosphere-only with perturbed SSTs (shorter term).

5) Predictability issues

- Use ensemble re-forecasts (global and regional) to answer predictability questions such as:
    - What kinds of systems are more or less predictable?
    - What situations have large model error (small spread/large error in the ensemble)?
- What obs are needed to improve forecasts at different time scales (particularly intensity)?
    - Leverage Sandy Supplemental OSSE effort.
    - Investigate use of ensemble forecast sensitivity to observation algorithms (e.g. Ota et al 2013: http://dx.doi.org/10.3402/tellusa.v65i0.20038)