Ensemble Representations of Rainfall Observation and Analysis Uncertainty

Test Bed Leader

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Test Bed Description

An ensemble description of observation and analysis uncertainty consists of a family of rainfall fields, each displaying realistic patterns of spatiotemporal variability while remaining consistent with available measurements. Such representations provide obvious advantages for assessing the propagation of rainfall measurement uncertainty though non-linear distributed hydrological models. Such information is expected to be an important contribution to the development of hydrologic ensemble data assimilation techniques. Stochastic rainfall simulations conditioned upon synoptic gauge observations have been investigated for some time while more recent work has yielded techniques capable of generating ensemble radar or satellite precipitation products. Further development is required to refine these techniques for operational application and to create hybrid ensemble methodologies capable of combining information from highly disparate sources.

Space/time scales of interest: The testbed is concerned with real-time rainfall observations, reconstructing historical rainfall datasets and nowcasting. Spatial scales of interest depend on the sensors employed to generate the ensemble products, but will most likely concentrate on larger basins (greater than 2000 km 2)

Experimental Design

- **characterizing model uncertainty (e.g., ensemble model simulations)**

  Testbed participants will be asked to produce estimates of uncertainty of each model state variable and model flux at each model time step and each sub-basin. Participants should provide model output in a prearranged format (e.g., NetCDF files containing all model states and fluxes with dimension (time, sub-basin, ensemble member) or dimension (time, sub-basin, mean, variance). These files may be used for the data assimilation task.

- **data assimilation**

  Testbed participants will be asked to update model simulations with observations of streamflow and snow water equivalent. Participants should provide (i) estimates of errors in observations; and (ii) estimates of the mean and uncertainty in each model state variable and model flux. Participants should provide output in an identical format to the uncertainty files.

Key Scientific Questions

- How do rainfall observation and analysis uncertainties translate into uncertainties in runoff and other hydrological variables, including hydrologic model state variables?

- How does rainfall observation and analysis uncertainty impact on hydrological model calibrations?

- What is the best mathematical representation of the spatiotemporal structure of rainfall measurement and analysis uncertainty?

- How best can an ensemble rainfall product be conditioned upon multiple disparate data sources?

Key Objectives of the Research Project

- To assess the utility of ensemble representations of rainfall uncertainty in operational hydrological modelling.

- To facilitate the development of hybrid ensemble approaches by building a community of interested research groups.

Data Resources

- A number of groups have developed conditional stochastic weather generators capable of generating ensemble rainfall products from satellite data, radar data and synoptic station data. If suitable input data are available, ensemble rainfall products could be generated for selected catchments.

- Partners are required who can run ensemble products through existing, well established distributed hydrological models.

See also: http://meetingorganizer.copernicus.org/EGU2009/EGU2009-7929.pdf