

NEESPI water and energy budget modeling

Questions that this group can address.

1. What is the spatial and temporal variability in the water and energy budgets across the NEESPI domain? Do the models capture the 'climate lag' observed in the region, particularly the relationships between seasonal precipitation and temperature, and seasonal precipitation and soil moisture?

Approaches: 1. Run off-line LSM intercomparison? Use atmospheric budget analysis, remote sensing, etc to constrain the models. 2. Use coupled models, and 20C climate model runs, to determine if they capture the observed relations (seasonality, spatial features, etc.) Needed data sources: Vegetation data sets (Chris Schmullius) and their extensions; forest inventory (etc.) data sets; Soil data (IIASA is the source); water management affects (reservoirs etc.). Validation data sets: River ice data (50 years up to 1990+ extension) (NISDC); river discharge data sets; snow data (Armstrong); tower flux data (ET), soil moisture data, ISCCP LandFlux data.

2. Can the models reproduce the observed climatology of precipitation in the orographically dominated regions?

Approach: 1. Run nested coupled models, and regional models, and compare to observations. **Need to search out high altitude stations.**

3. To what extent is orographic precipitation a critical feature of the regional NEESPI climate, and if so where.

Approach: 1. Use off-line LSM. Need to identify stations that reflect the orographic precipitation and get an estimate of the orographic precipitation.

4. What key features of the land surface do the current generation of land surface models fail to capture? (e.g. wetlands, permafrost regions, semi-arid regions, dynamics of freeze-thaw and its N-S movement, water management (Aral Sea, NW China drying up of lakes/ivers –reservoirs, irrigation.)

Approach: Testing parameterizations in off-line land surface models. Need to identify high quality, local scale data ('experimental basins', water balance stations). Can remote sensing (radar data and scatterometer) help with wetland/lake dynamics?

5. What are important processes, critical to NEESPI water and energy cycles, are poorly captured in current land surface models? (e.g. Snow redistribution, groundwater-surface water interactions, dust generation (grazing effects), energy exchange among different surfaces).

Approach: Run specific case studies to test parameterization in coupled models, particularly for dust generation. Potential data include MODIS satellite data, soil moisture stations for profile simulations and/or soil moisture remote sensing?

6. Understanding the dynamics of incoming solar radiation and the dynamics of the land surface response.

Approach: Use RS array tracking approaches that may use useful in developing LSM parameterizations (feasible?).

7. Understanding the importance of snow-radiation interactions in the NEESPI domain (e.g. forest regions, Mongolia), and the adequacy of the model parameterizations for this process?

Approach: Need small-scale, site specific data to test the parameterizations, (and the approach from #7??)

Needed Data by ecologists

River discharge

Snow cover

Timing of snowmelt

Vegetation cover and type

Solar radiation

Frozen ground