SPATIAL ANALYSIS

The lack of dense ground monitoring in the developing world impedes hydrologic modeling. Methods exist that can adjusted satellite precipitation products supporting more robust hydrological modeling. However, high quality ground data may not exist in every 0.25 degree pixel. Below is illustrated how streamflow performance degrades with spatial transfer distance (the distance in degrees between the centroid of the watershed and the rain gauge).

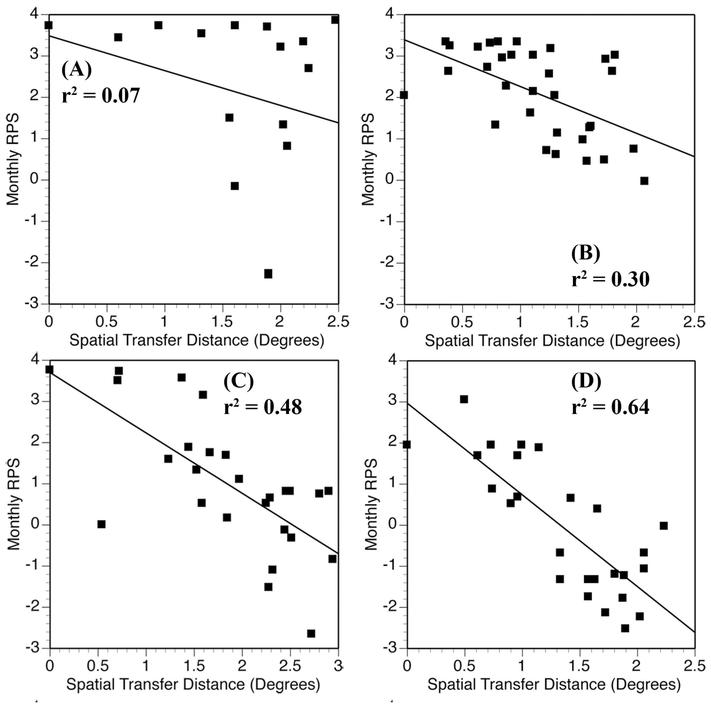


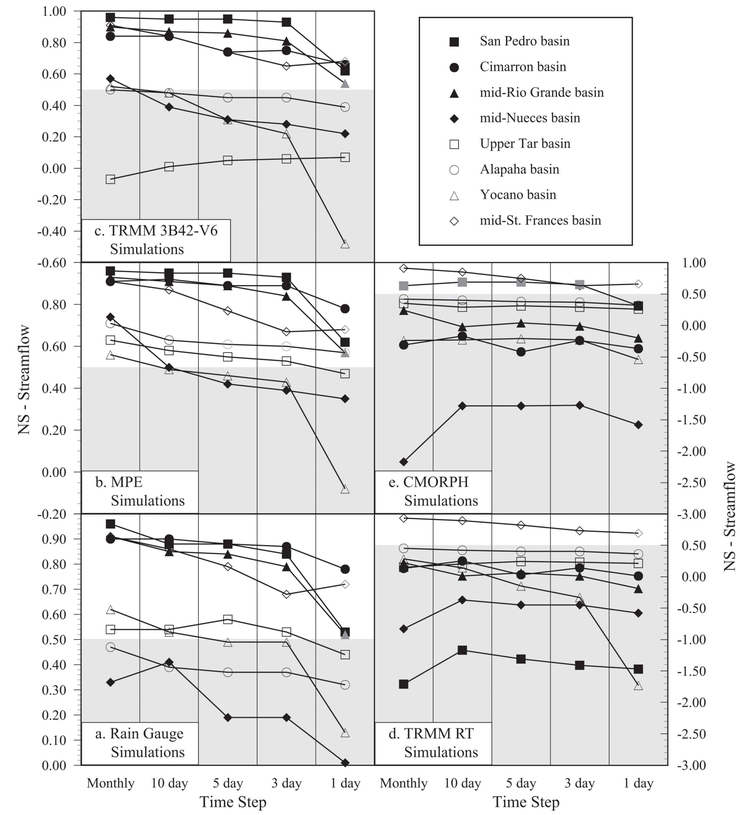
Figure above: Streamflow simulations based on adjusted TRMM-RT precipitation data. (A) San Pedro Basin, Arizona; (B) Cimarron Basin, Oklahoma;(C) mid-Rio Grande Basin, Texas & Mexico; (D) middle Nueces Basin, Texas;

Conclusion - Streamflow performance becomes unacceptable with spatial transfer distances in excess of 1 to 2 degrees.

TEMPORAL ANALYSIS

Systematic evaluation of streamflow modeling between monthly and daily timescales was made. Streamflow from 8 watersheds across CONUS based on five precipitation products is intercompared . Timescales examined include monthly, dekad (10 day), pentad (5 day), triad (3 day), and daily.

Figure to right: Streamflow Performance (NS) as a function of timescales [dekad (10 day), pentad (5 day), triad (3 day), and daily (1 day)] for eight examined basins. Gray field below NS=0.50 indicated unacceptable simulations as do gray symbols above NS values of 0.50, which have either poor MBE and/or CP values. Five panels (a to e) indicate simulations based on the five precipitation products evaluated in this study (Rain Gauge, MPE, TRMM 3B42-V6, TMPA RT, CMORPH).

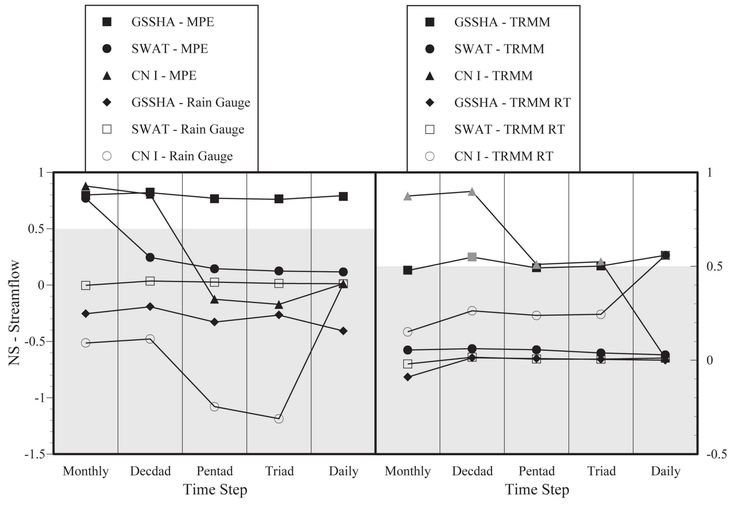


Conclusion - Rain gauge, MPE and TRMM 3B42-V6 have similar results with a strong positive correlation between performance metrics and time step at which model performance deteriorates. Basically, better performing simulations, with higher Nash-Sutcliffe values of 0.80 and above can support modeling at finer timescales to at least daily and perhaps beyond into the sub-daily realm. TRMM-RT and CMORPH have comparatively poorer results at all time scales.

MODEL COMPLEXITY

To gauge the importance of model complexity intercomparison of simulated streamflow between Curve Number, SWAT, &GSSHA was made using MPE, rain gauge, TRMM-3B42-V6 and TRMM-RT. So far work as been completed for the San Casiniro Basin (720 km²) in South Texas.

Figure to right: Streamflow Performance (NS) as a function of timescales [dekad (10 day), pentad (5 day), triad (3 day), and daily (1 day)] for MPE, Rain Gauge, TRMM 3B42-V6 and TRMM-RT driving Curve Number, SWAT, and GSSHA models. Gray field below NS=0.50 indicated unacceptable simulations as do gray symbols above NS values of 0.50.



Preliminary Conclusion - More complex hydrologic models can support modeling at finer time scales.

SUMMARY

(1) Adjustment of satellite precipitation data can be facilitated over a distance of 1 to 2 degrees, which corresponds to e-folding distance of satellite products.

(2) Real-time TRMM and CMORPH products perform more poorly than TRMM 3B42- V6. The SWAT model performance drops off between monthly and daily time scales. Results regarding the time scale at which model performance drops-off has implications for the type of hydrologic application that can be supported.

(3) More complex models such as GSSHA have the potential to support hydrologic modeling at sub-daily time scales.