Studies of Error Structure of GPM Rainfall Estimates and Scale Aspects of Floods

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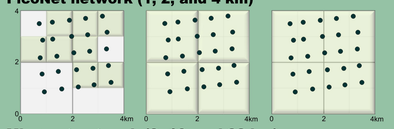
NASA

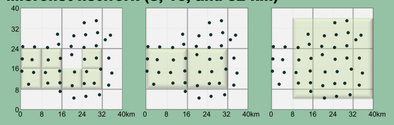
201
Poster Number

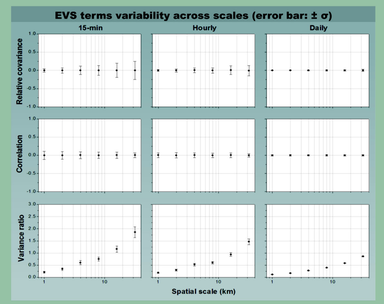
Grid and gauge network configuration

PicoNet network (1, 2, and 4 km)



Micronet network (8, 16, and 32 km)





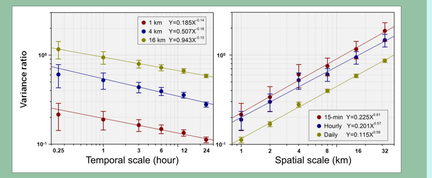
Error Variance Separation (EVS)

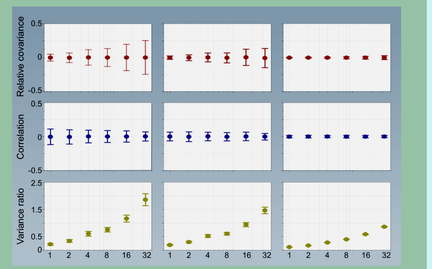
$$Var[R_R - R_G] = Var[R_T - R_R] + Var[R_T - R_G] - 2Cov[R_T - R_R, R_T - R_G]$$

$$Var[E_R] = Var[D_{RG}] - Var[E_G] + 2Cov[E_R, E_G]$$

Useful representation: relative covariance & variance

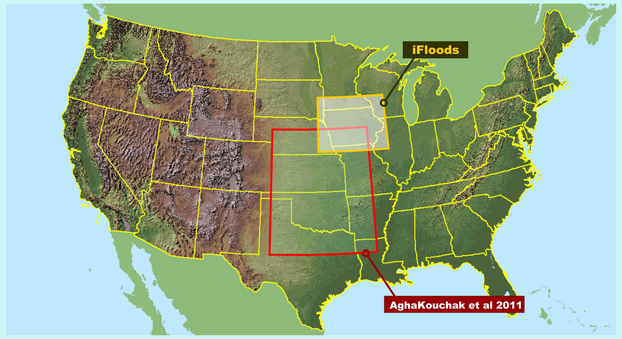
$$\frac{2Cov[E_R, E_G]}{Var[E_R]} = 2Corr[E_R, E_G] \cdot \left(\frac{Var[E_G]}{Var[E_R]}\right)^{\frac{1}{2}}$$

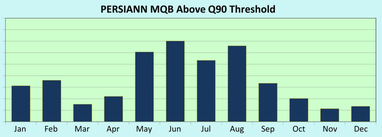




Conclusions

- The hypothesis is valid for smaller scale, but might be violated for larger scale due to larger variability of the covariance term. The variability of the relative covariance becomes larger with smaller temporal and larger spatial scale.
- Temporal and spatial variability can be characterized by simple scaling behavior (power-law).





Satellite Rainfall Estimation - PERSIANN

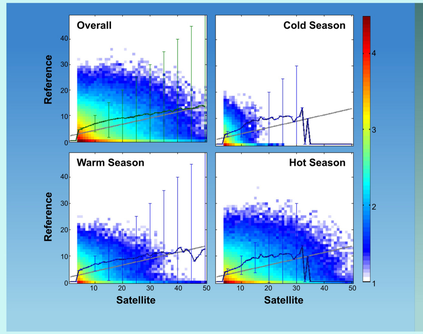
Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks, geo-stationary satellites, 3h accumulated and 0.25 degree spatial resolution rainfall estimation

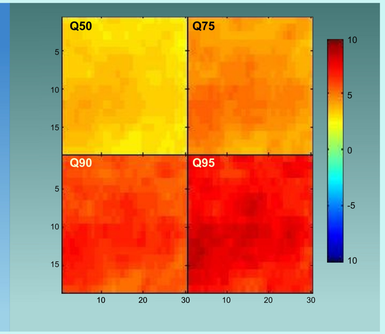
Reference Rainfall Estimation - StageIV

Mosaicked into a national product at NCEP (1hr , 4km resolution) aggregated to the satellite resolution

Mean Quantile Error

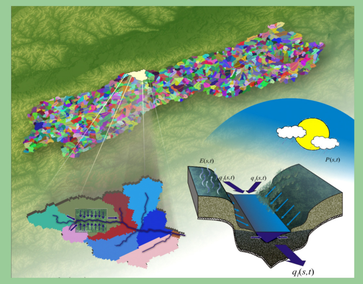
$$\mathrm{MQE} = \frac{\sum_{i=1}^{n}(P_{sat}|P_{sat} \geq t) - (P_{ref}|P_{ref} \geq t)}{n}$$

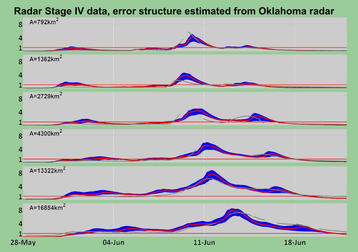


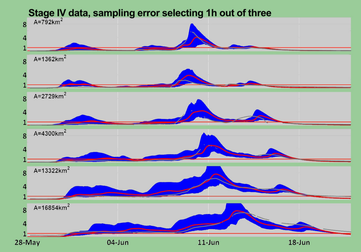


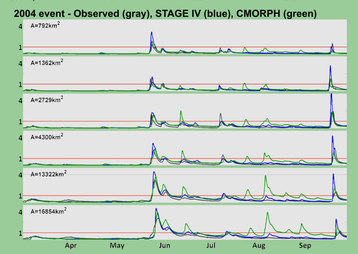
Conclusions

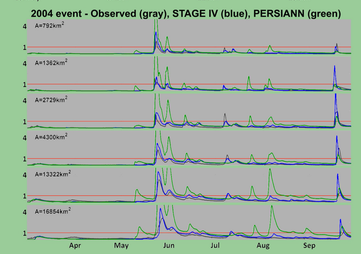
- Satellite product evaluation is underway for the Iowa (iFloods) domain
- NEXRAD products seem adequate as reference, despite their own uncertainties, due to large errors in the satellite products

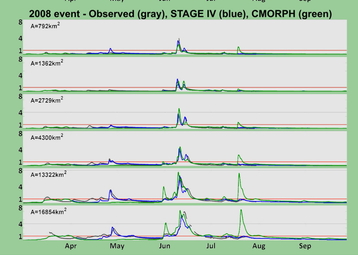


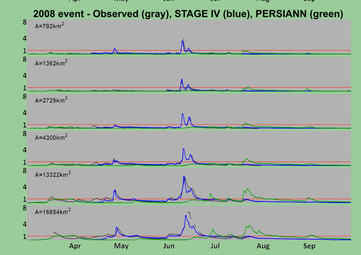












Conclusions

- Calibration-free rainfall-runoff model provides a fair evaluation of the hydrologic significance of the uncertainties included in the satellite-rainfall products
- It is clear that as the spatial scale increases the performance improves