NASA Next Generation Geodetic Networks Simulations

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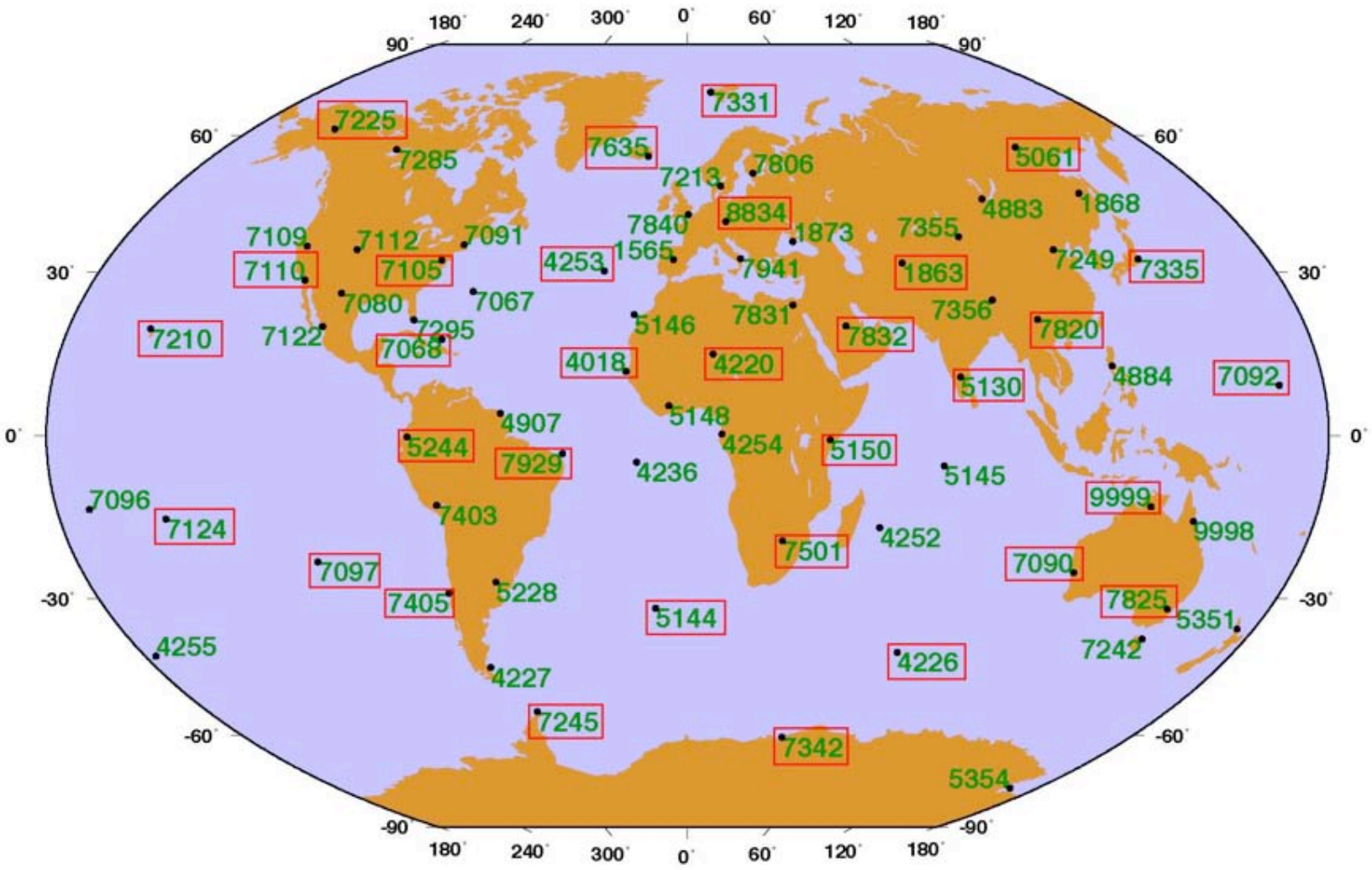
NNGGN Simulations

- SLR and VLBI optimal combination (first step):
  - ✓ Simulation of SLR and VLBI data for the past 13 years (to develop a calibrated error model)
  - – Covariance analysis of several variants of ~ 70 globally distributed sites in various size sub-networks (underway)
  - – **Simulation of a 6-7 year period with SLR and VLBI data (2000-2006)**
    - ▪ VLBI group developed an efficient procedure to generate multi-year schedules in a simplified way (sidereal shift)
  - – Inclusion of GNSS, etc. later, in a second step

NNGGN Simulations, cont.

- A procedure was developed by which VLBI schedules generated by the Goddard VLBI group can be transferred to us and we will then use them to generate normal equations with GEODYN
- Dave Rowlands generated a package of programs+scripts that we installed at JCET/UMBC and tested, and we can now use them as the interface in the above process
- A s/w limitation was identified in the VLBI s/w limiting the maximum network size to 32 stations, so will start with 32 as the size of maximal network to save time
- A set of test VLBI setups was used to check and validate the successful implementation of the s/w at JCET

Maximal Overlapping SLR-VLBI Network (**32**)



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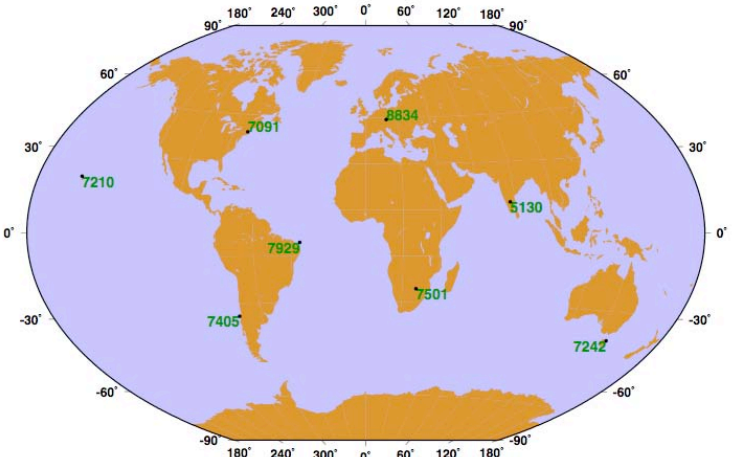
Covariance Predictions for Sub-networks

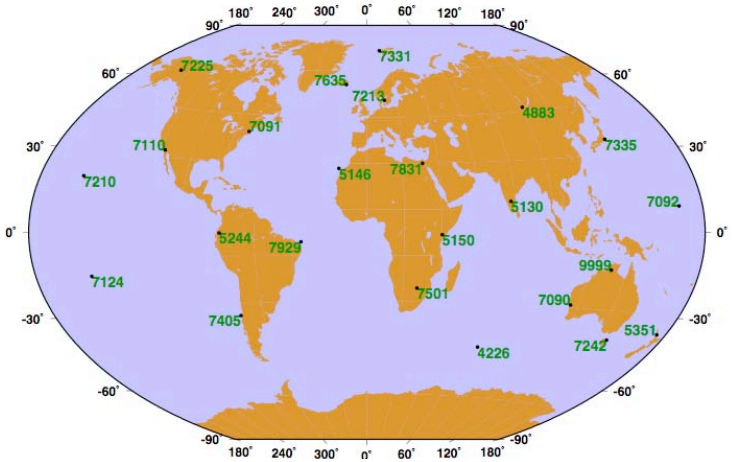
- The covariance of the 14-parameter similarity transformation is computed for progressively smaller networks, and the degradation in the accuracy of these estimates is noted as the network size decreases or the site distribution degrades
  - Covariance studies with Monte Carlo runs
  - Simulation of SLR and VLBI data for 6-7 years for a few selected networks identified from the above process as key configurations

Network variants (8 ⇒ 32)

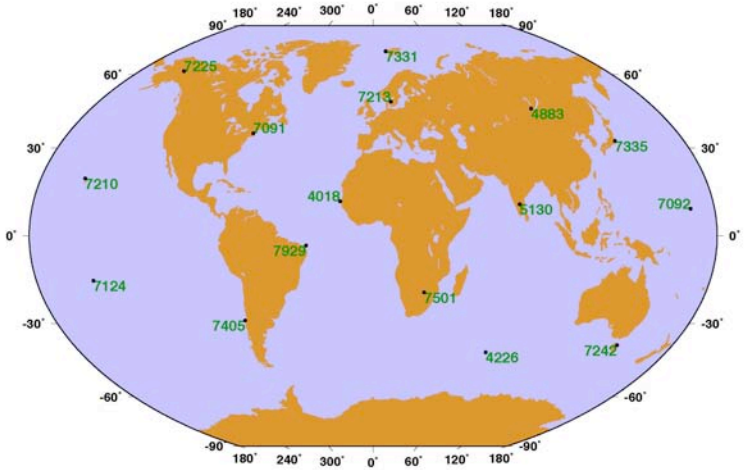
Next Generation NASA Networks 08 sites



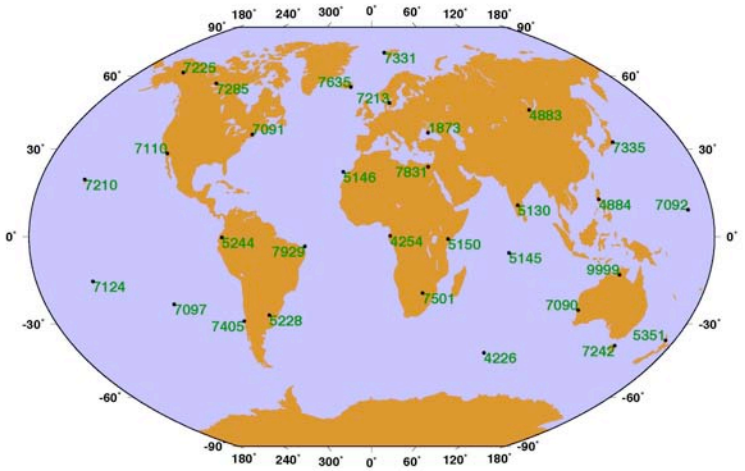
Next Generation NASA Networks 24 sites



Next Generation NASA Networks 16 sites



Next Generation NASA Networks 32 sites



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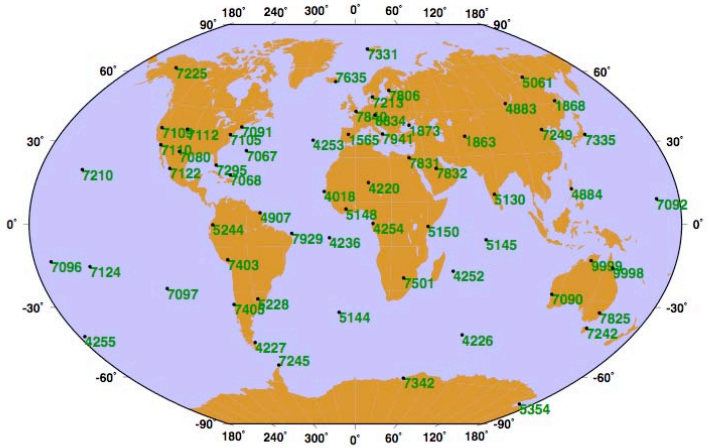
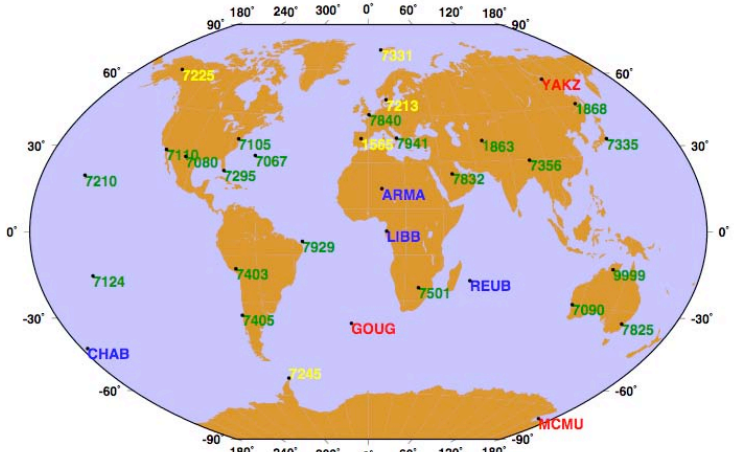
Network variants (63 ⇒ 15)

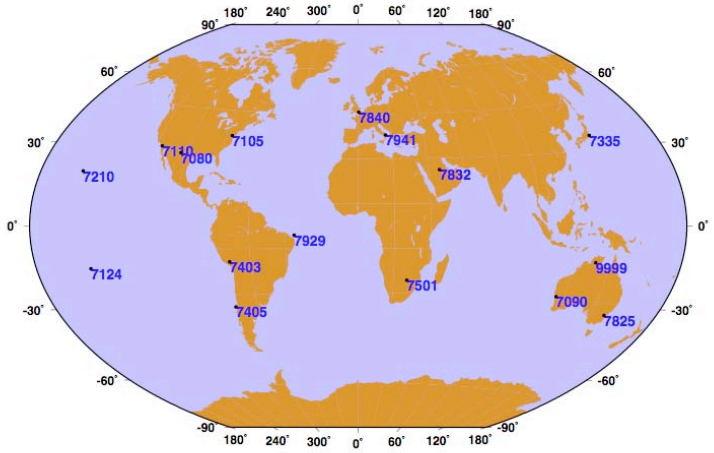
Next Generation NASA Networks 63 sites



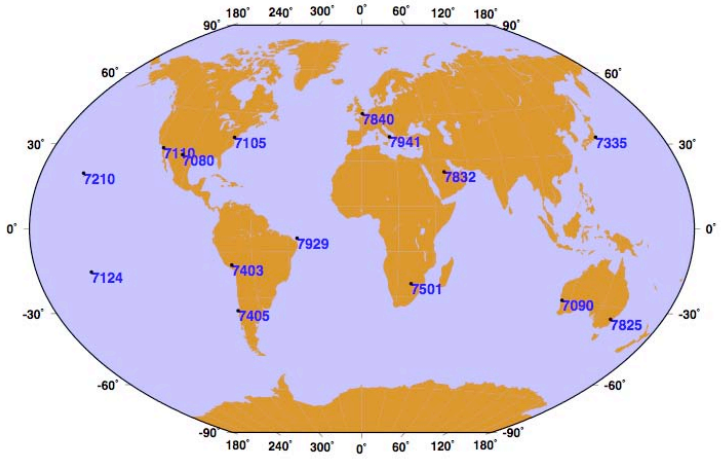
Next Generation NASA Networks 30 sites



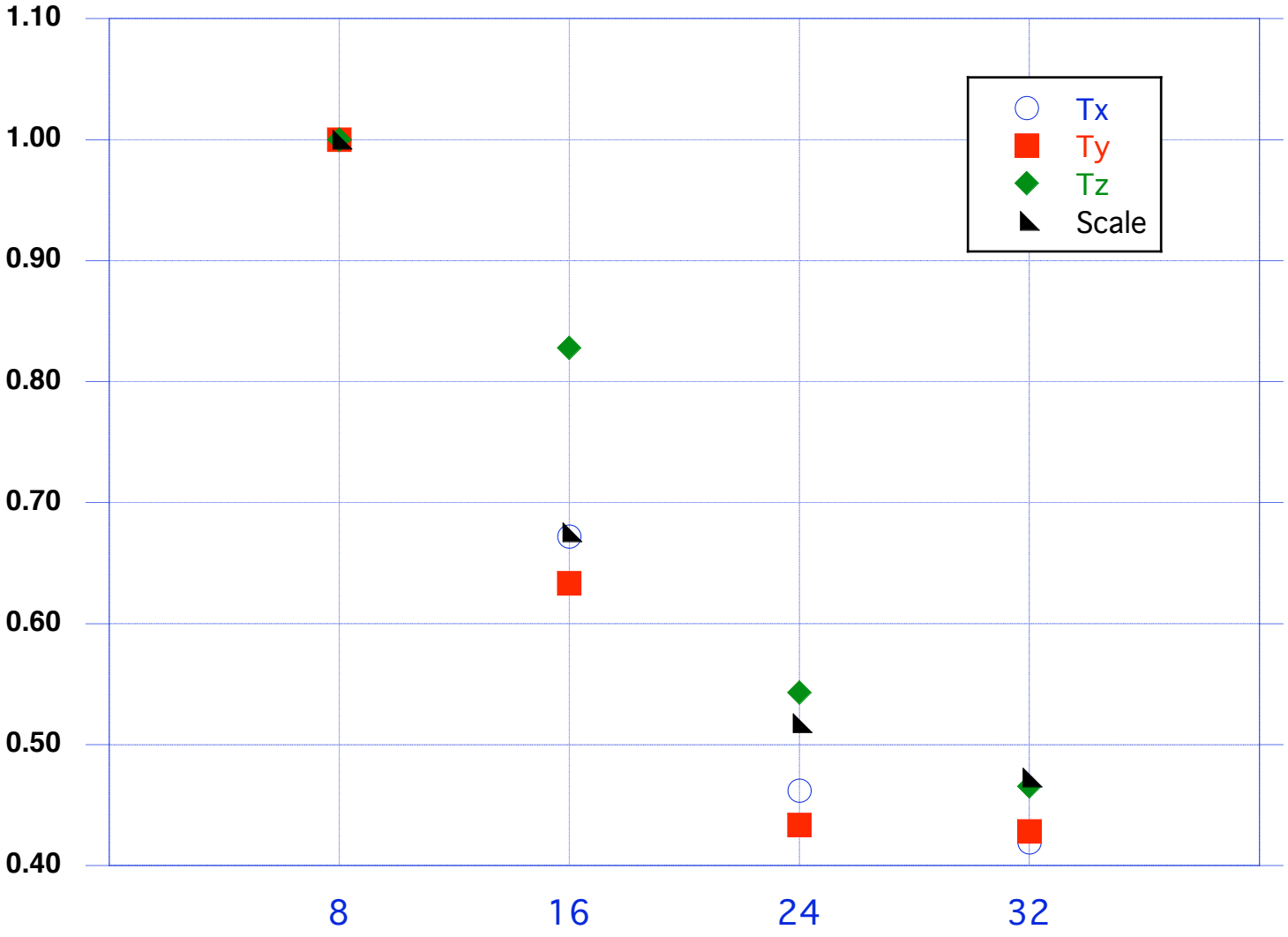
Next Generation NASA Networks 16 sites



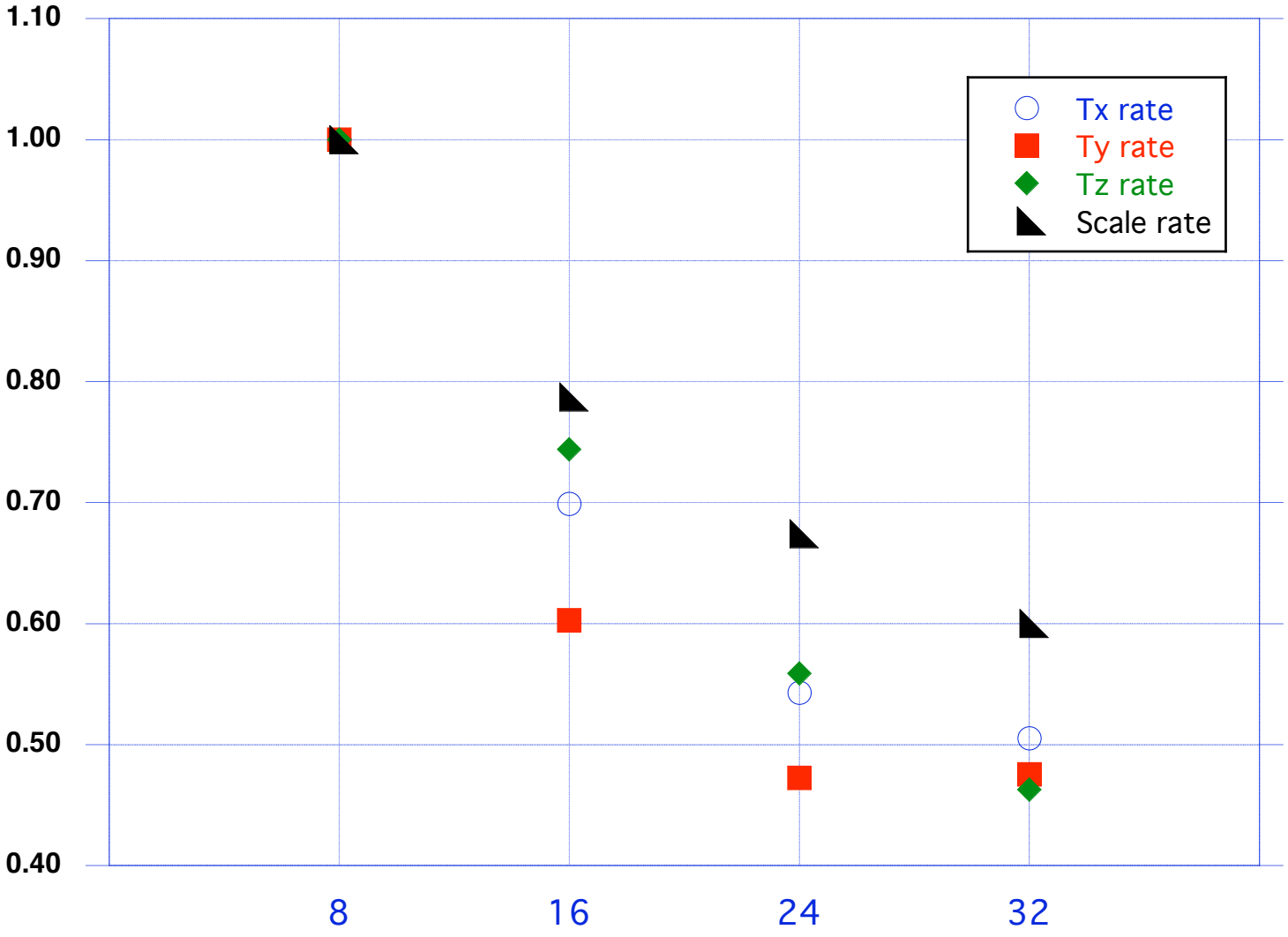
Next Generation NASA Networks 15 sites



Covariance Results



Covariance Results, cont.



Summary

- The Z-component of the origin, the scale and their rates are the parameters most affected by the size of the defining network
- Once we have more than ~24 sites improvement is coming very slowly
- The simulation process near the final step, the combined recovery of a TRF from simulated SLR and VLBI data will be presented at EGU'07