

AuScope Simulations for 3rd SLR Site in Australia

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Introduction

- The Australian government approved a large scale Earth science project similar to USA's EarthScope, under the name AuScope
- The GGOS GNC WG was approached by Geosciences Australia and AuScope scientists, to provide input for optimal selection of an additional SLR site co-located at one of the new VLBI sites

AuScope

National Collaborative Research Infrastructure Program



An initiative by the Federal Government to inject ~550million AUD into research infrastructure over 5 years

After a call for proposals across all science disciplines 16 were selected for further development.

AuScope: Structure and Evolution of the Australian Continent.

AuScope

- The current plans (**AUS\$15.8 awarded**) for infrastructure improvement include:
 - 3 New VLBI Antenna (Mt Pleasant, Yarragadee, and Katherine (North Central Australia))
 - VLBI software correlator
 - 1 Absolute gravimeter
 - 1 Tidal gravimeter
 - a Multi pier gravity calibration facility (Mt Stromlo)
 - upgrade to the laser power at Mt Stromlo for more effective MEO ranging
 - FTLRS campaign at Burnie (Tasmania) for altimeter calibration
 - Approximately 110 new GNSS sites

Add new (3rd) SLR or not?

Is there a compelling need for a third SLR system?

- Examination of whether a third SLR laser site in northern Australia (colocated with VLBI near Katherine) is necessary in order to meet the long-term accuracy goals:
 - For Australian reference frame, and
 - As a contribution to the global reference frame

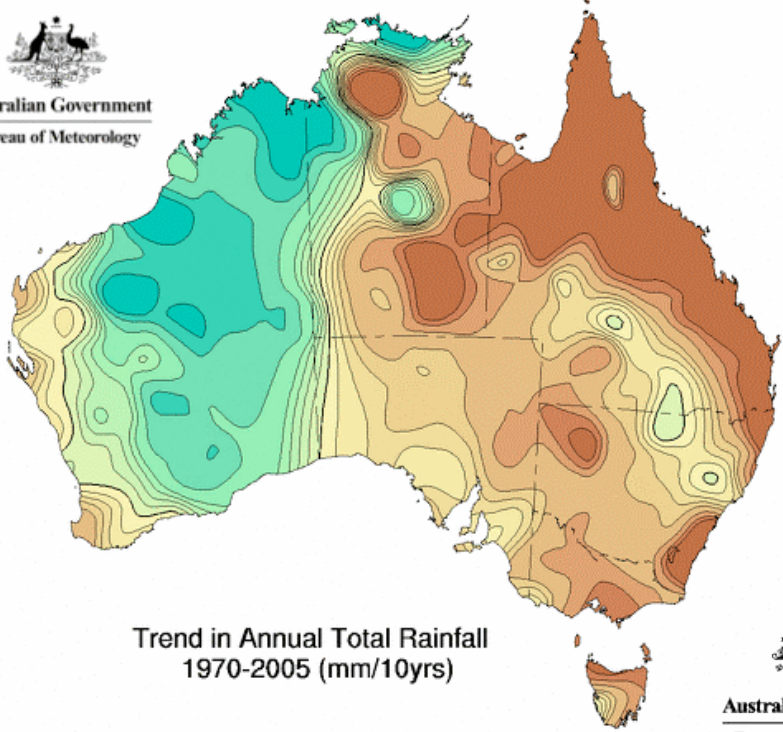
Cost of construction and operation of laser station in remote area is high and will need good reasons!

AuScope

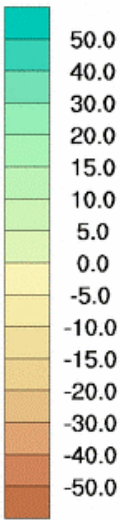




Australian Government
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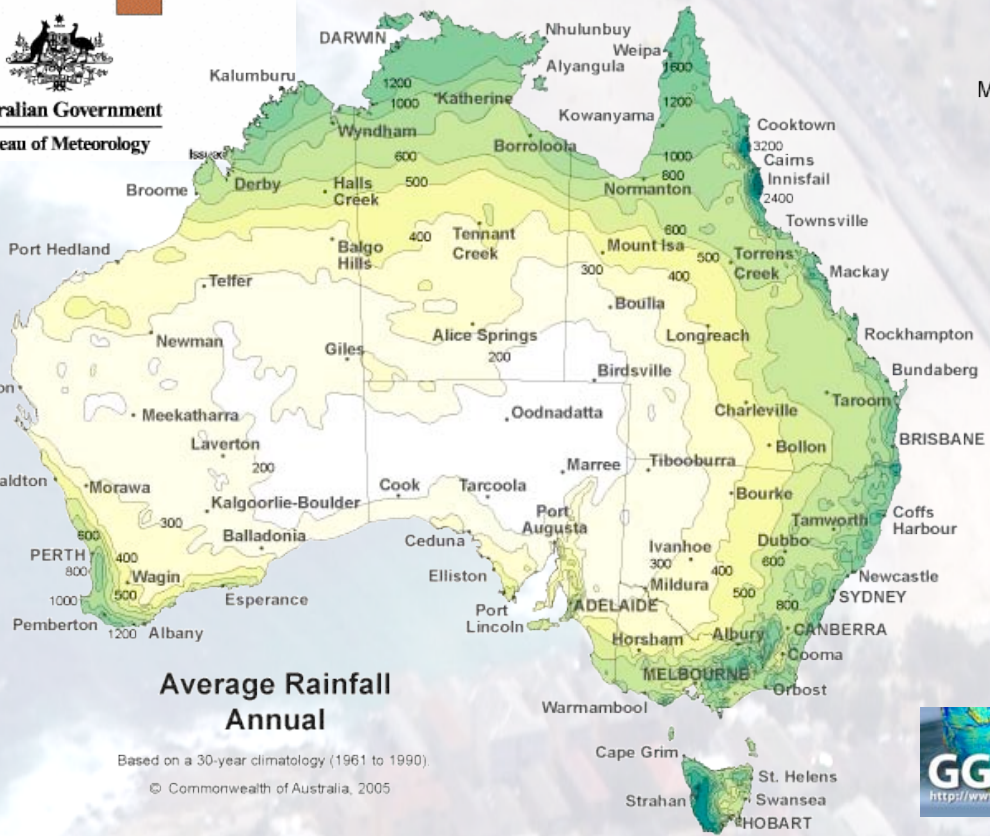


Trend in Annual Total Rainfall
1970-2005 (mm/10yrs)

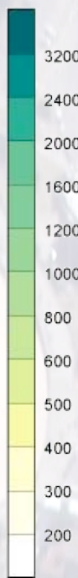


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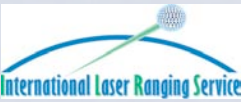


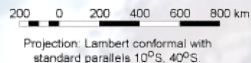
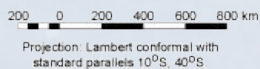
Millimetres

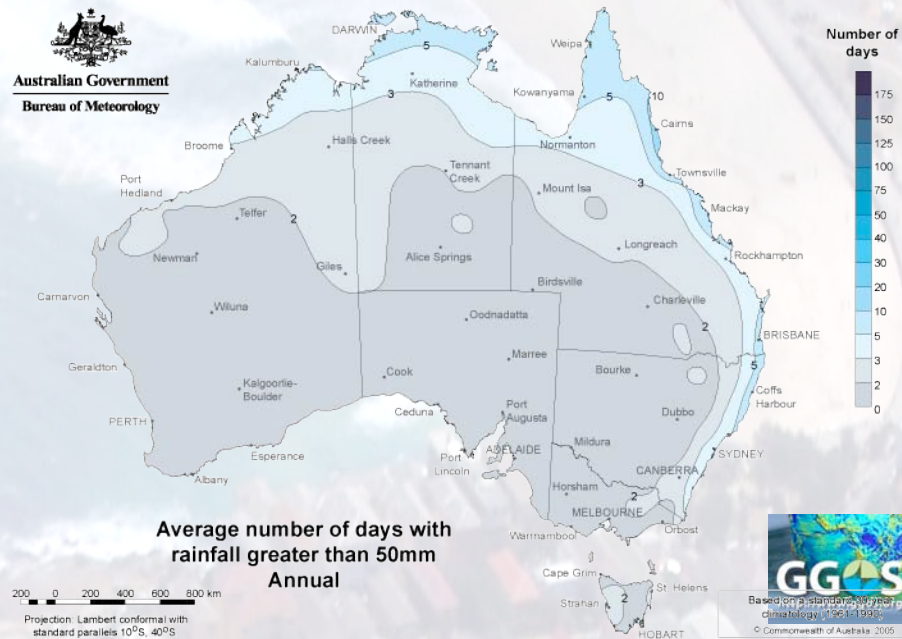
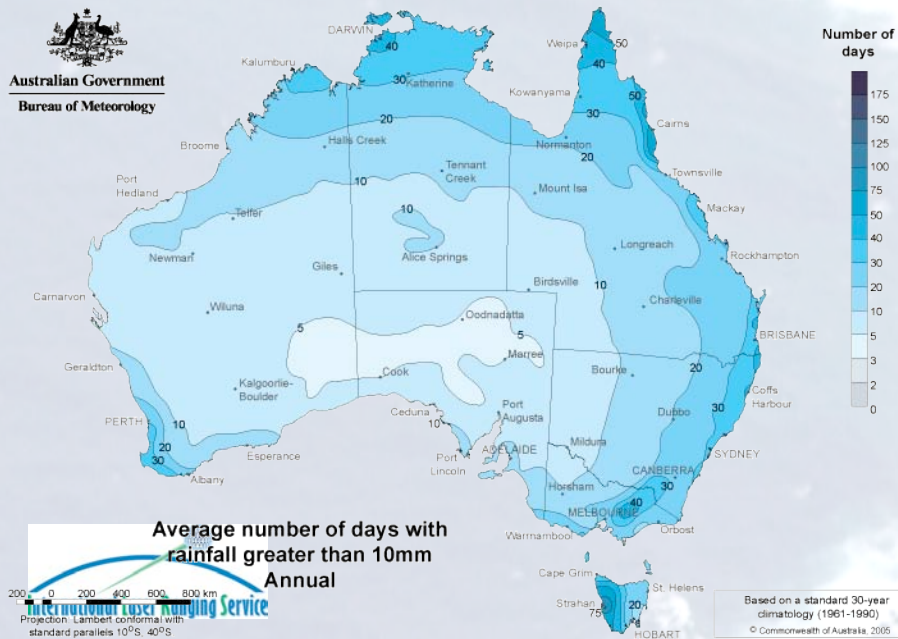
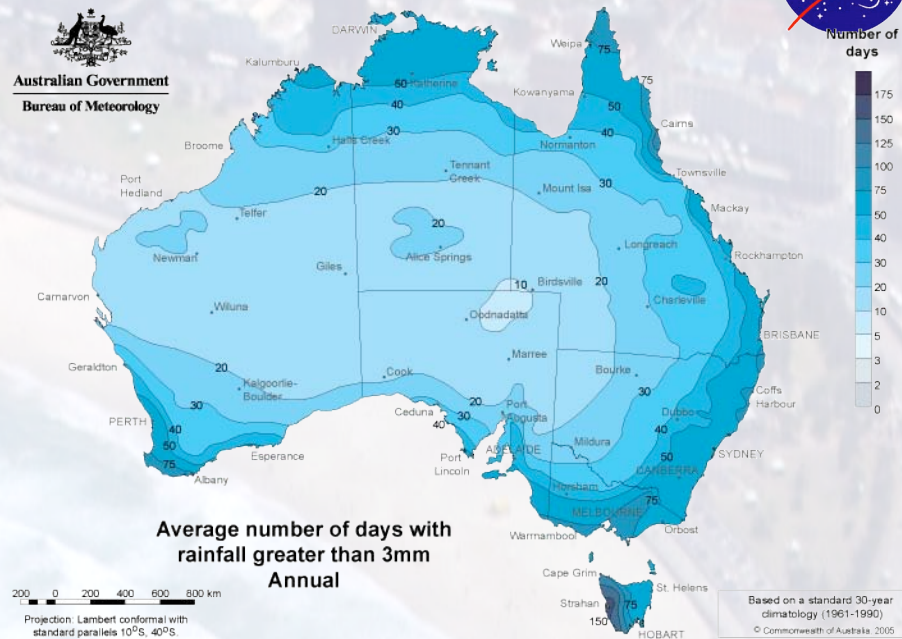
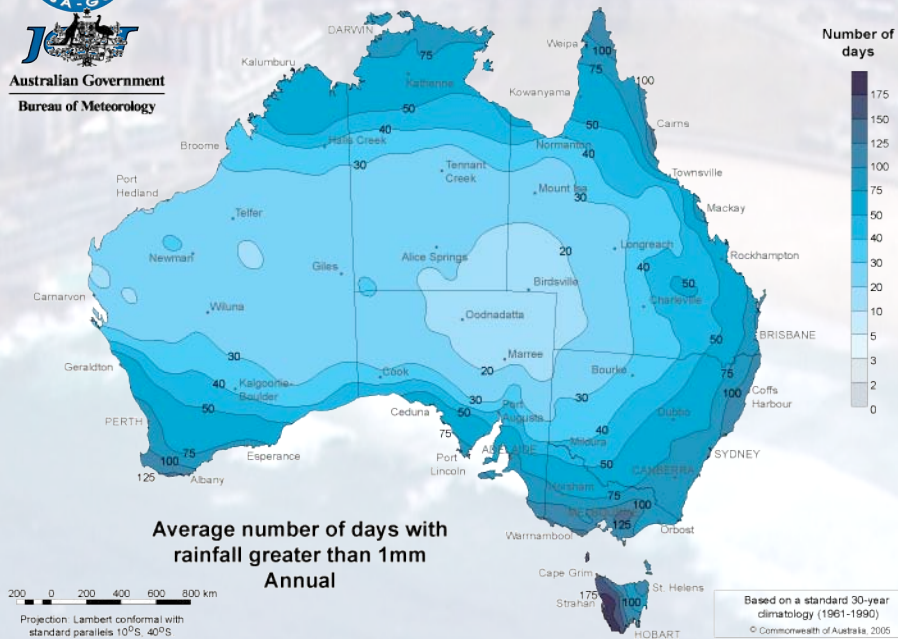


Average Rainfall
Annual

Based on a 30-year climatology (1961 to 1990).
© Commonwealth of Australia, 2005

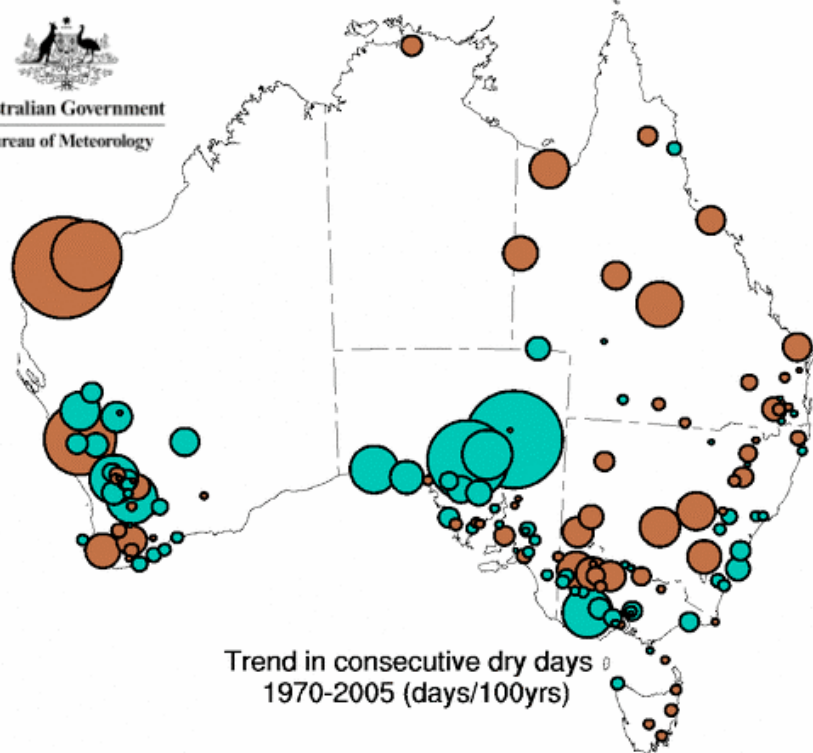




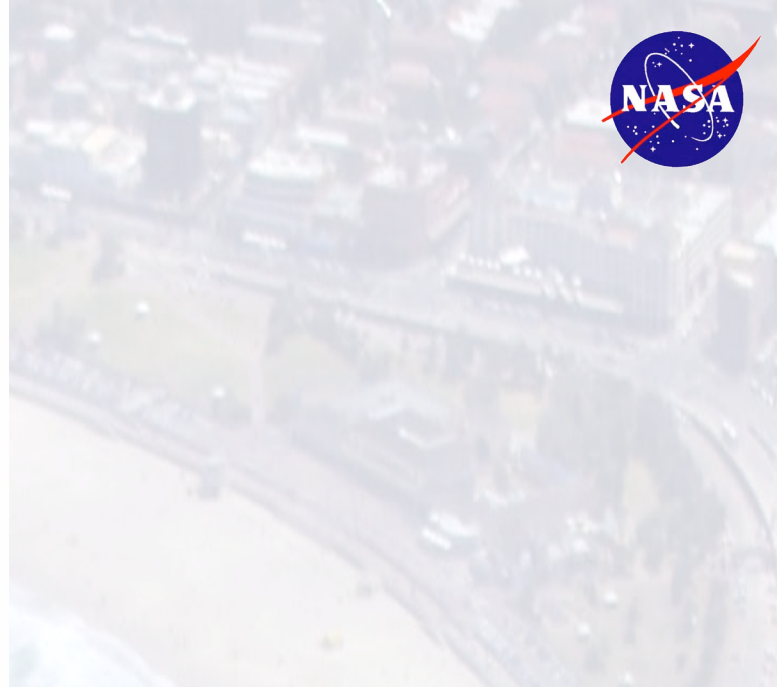
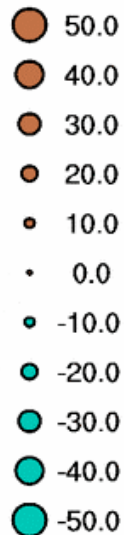




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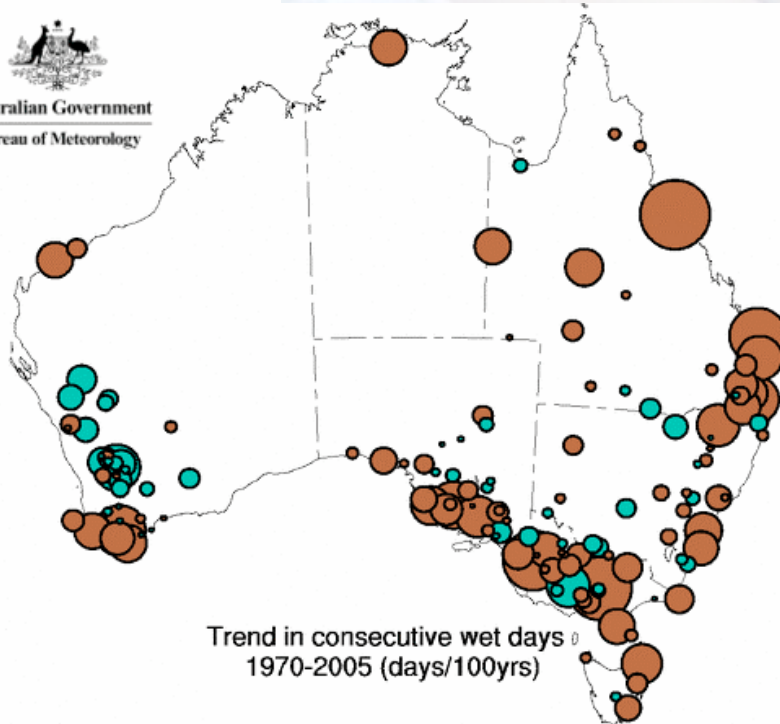
Trend in consecutive dry days
1970-2005 (days/100yrs)



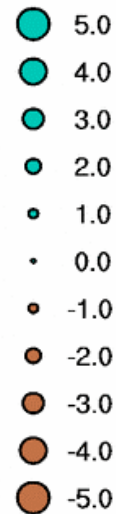
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Trend in consecutive wet days
1970-2005 (days/100yrs)



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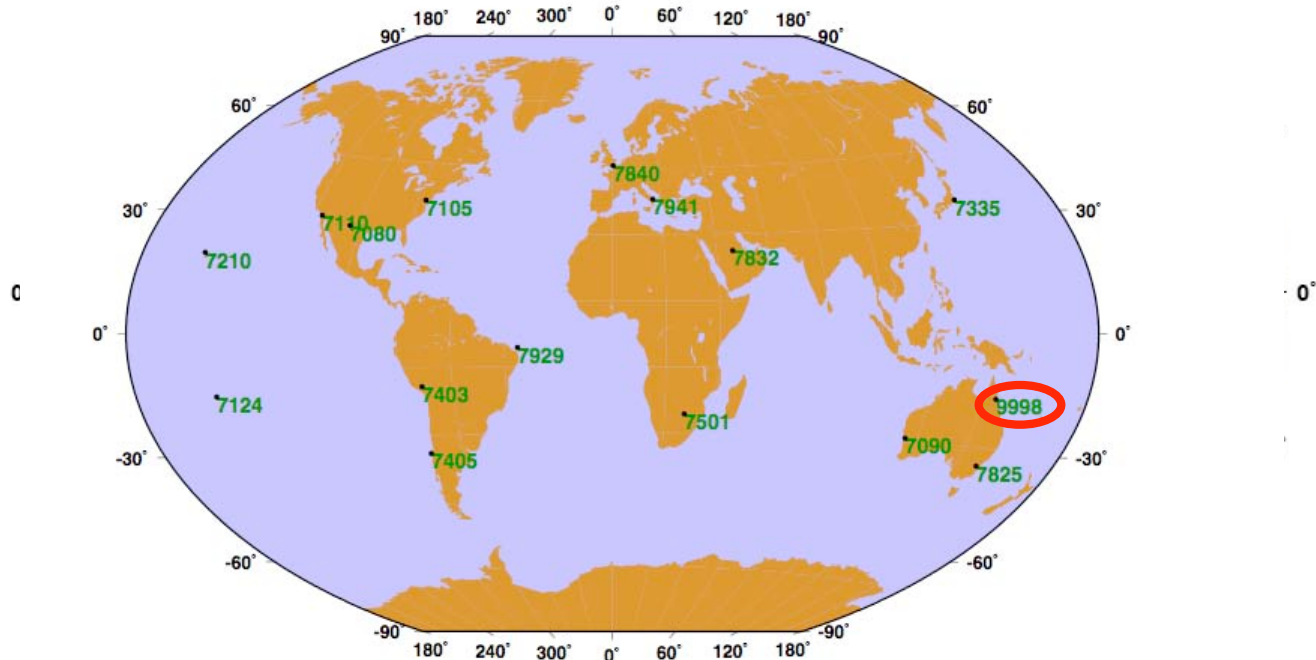
Studies for TRF Contribution

- Two approaches:
 - Covariance studies with Monte Carlo runs
 - Simulation of SLR and VLBI data for:
 - the existing network
 - the existing network PLUS VLBI at Yarragadee and Katherine
 - the above PLUS a SLR co-located with the VLBI at Katherine
 - SLR@KATH operating similar to Mt. Stromlo

SLR addition at KATH

KATH co-location of SLR-VLBI will add much-needed dual site in an area void of such and will strengthen the eastern hemisphere ties for these two techniques

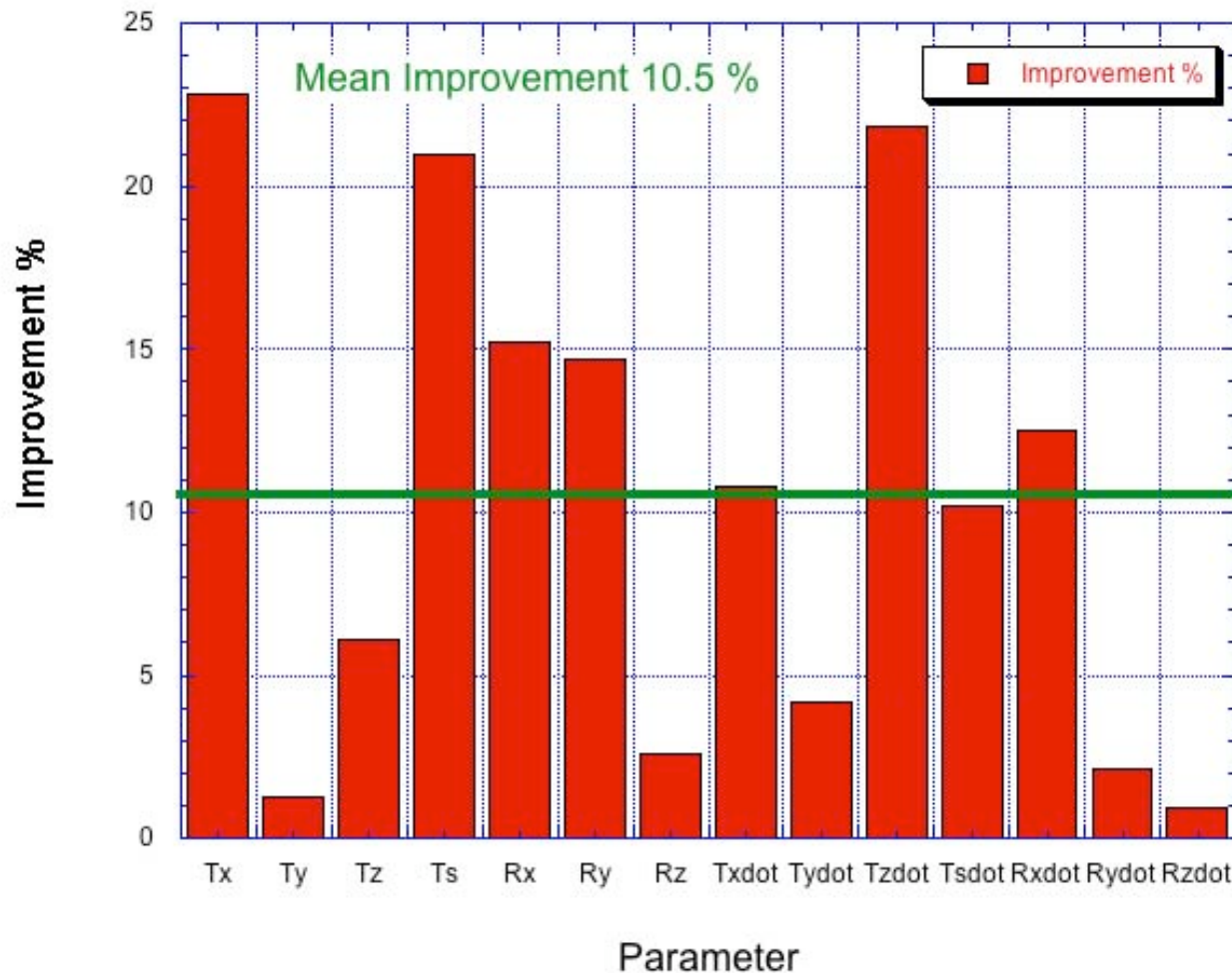
Next Generation NASA Networks 16 sites



SLR @ KATH

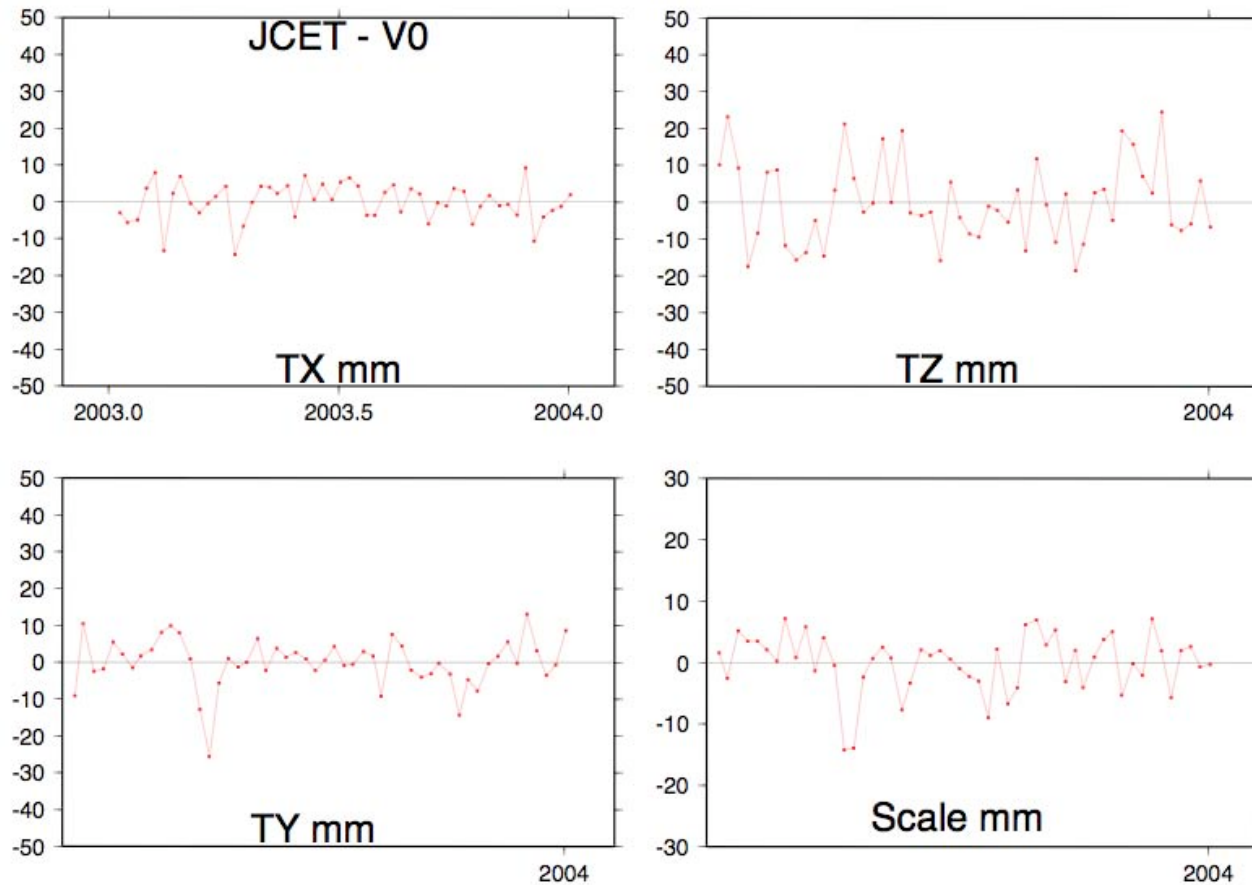
Monte Carlo - predicted covariance

TRF Component Improvement Due to Inclusion of KATH_SLR



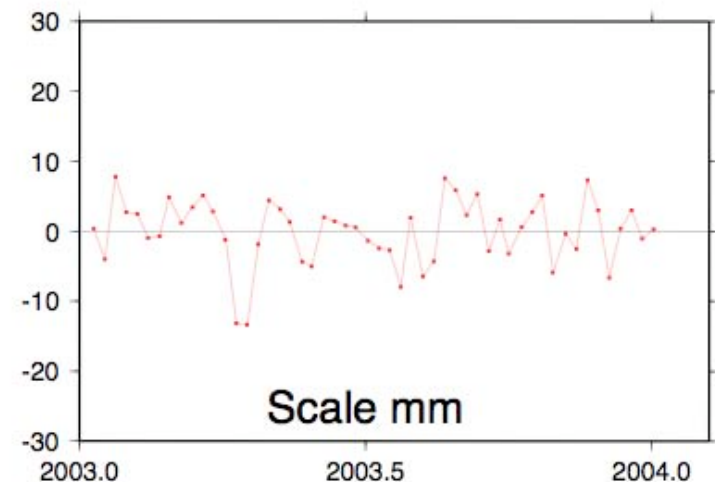
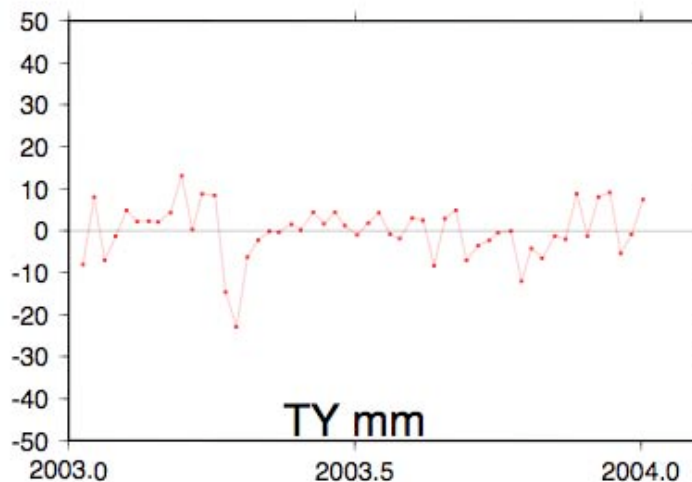
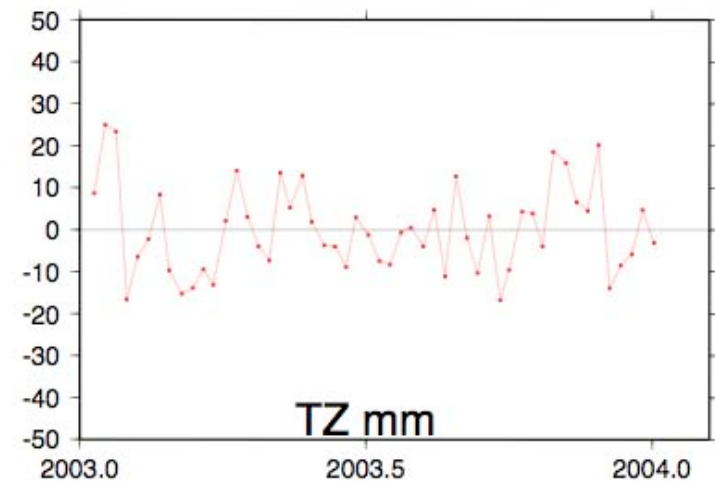
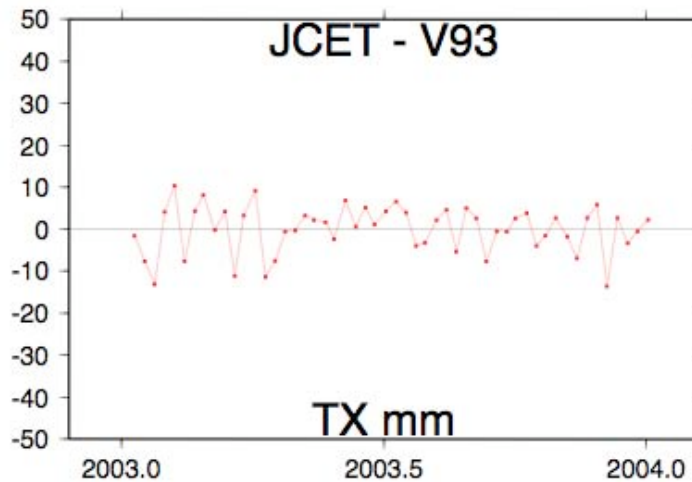
One Year Simulation (2003)

Standard SLR network simulated data reproduce the origin and scale variations observed with real data:

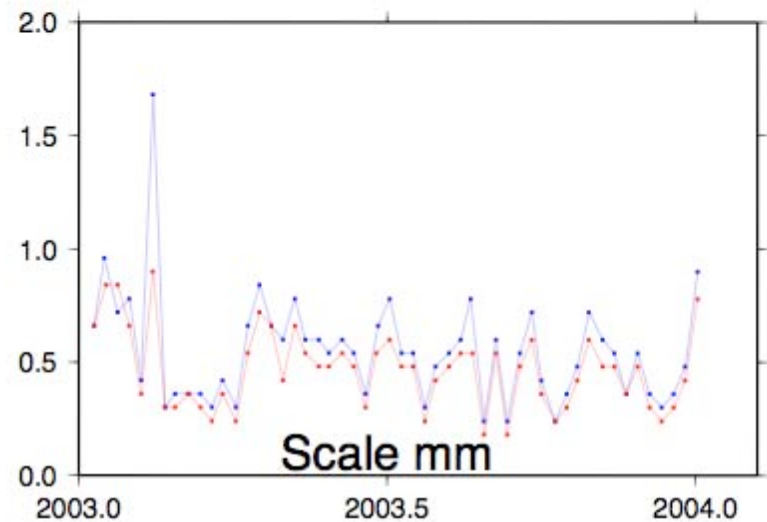
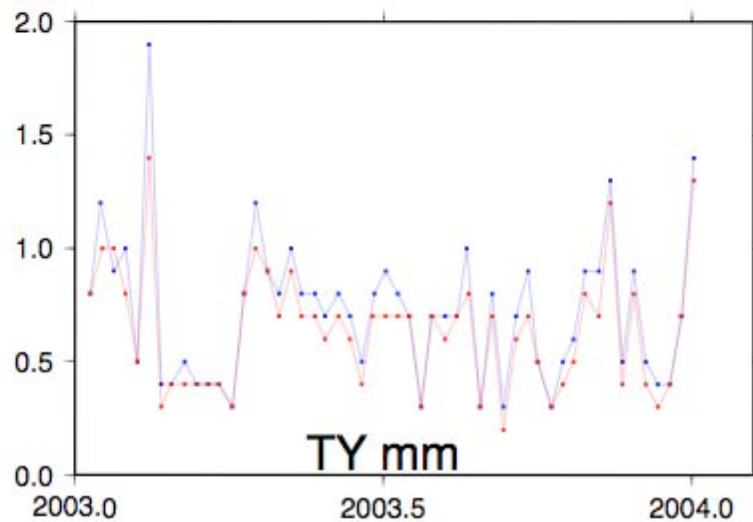
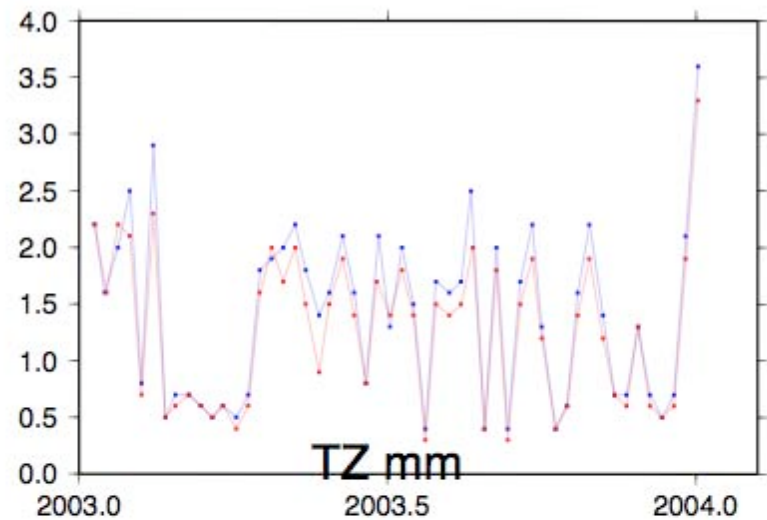
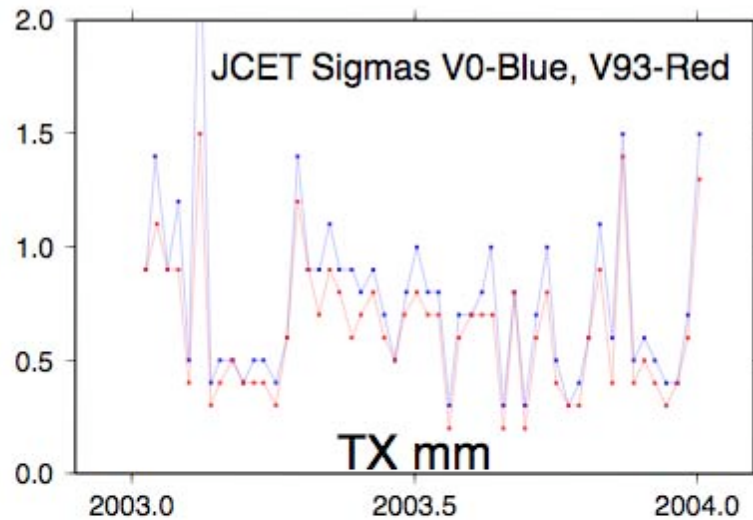


Addition of SLR@KATH

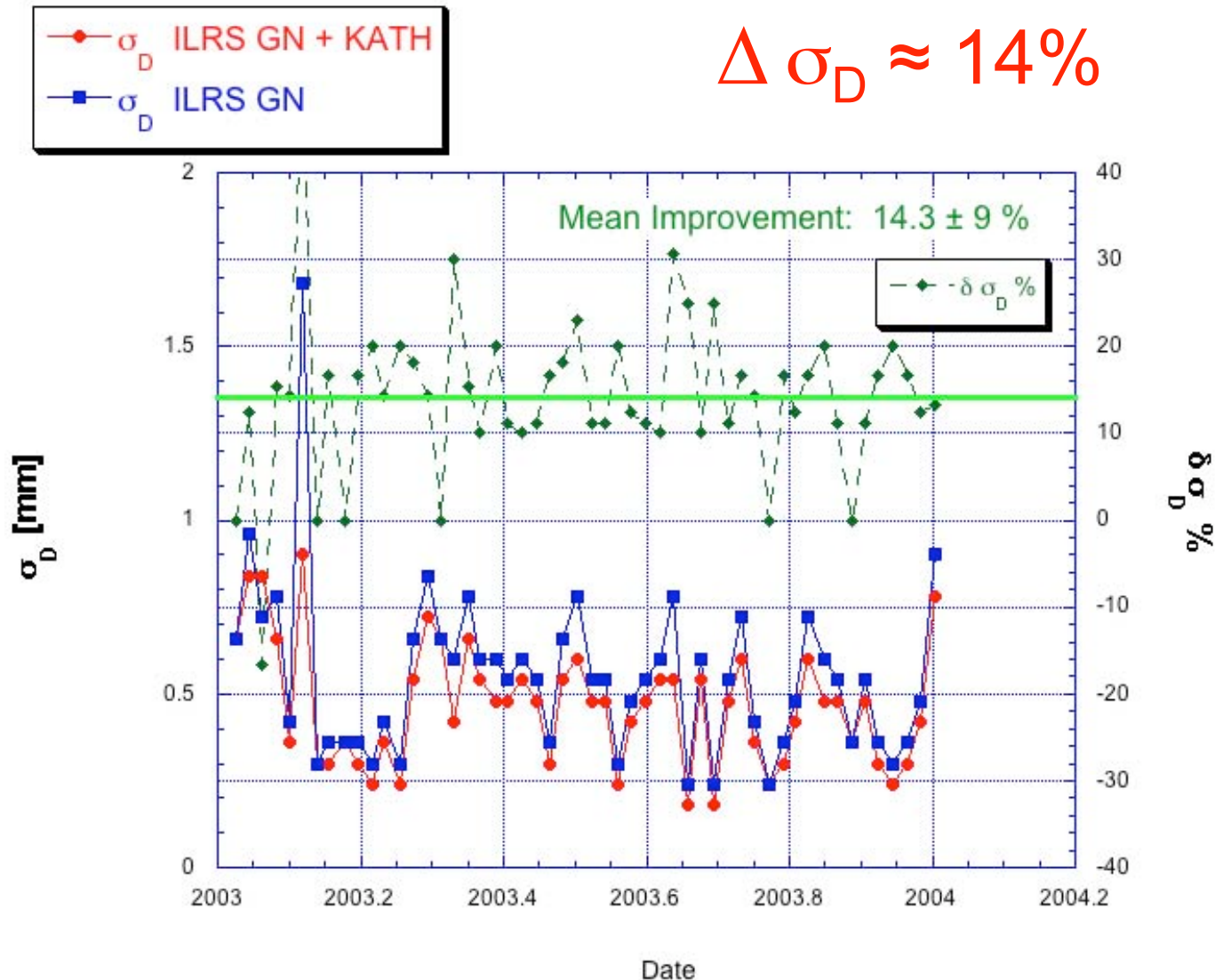
- As expected, addition of one site does not change dramatically the results:



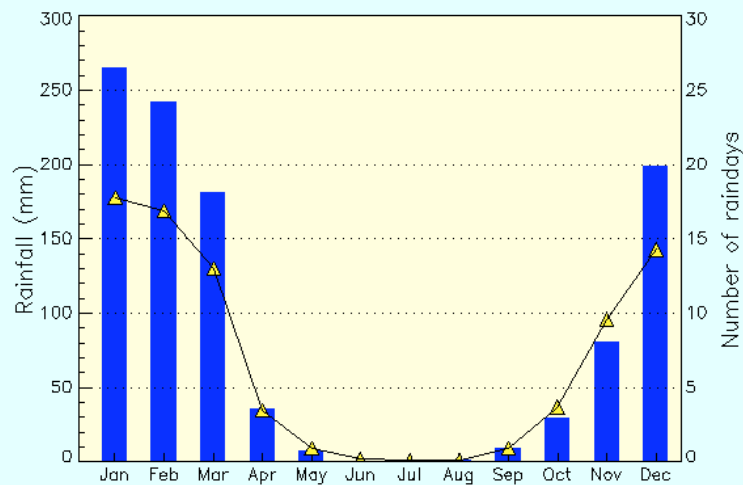
Change in Error Estimates



Change in scale σ due to SLR@KATH

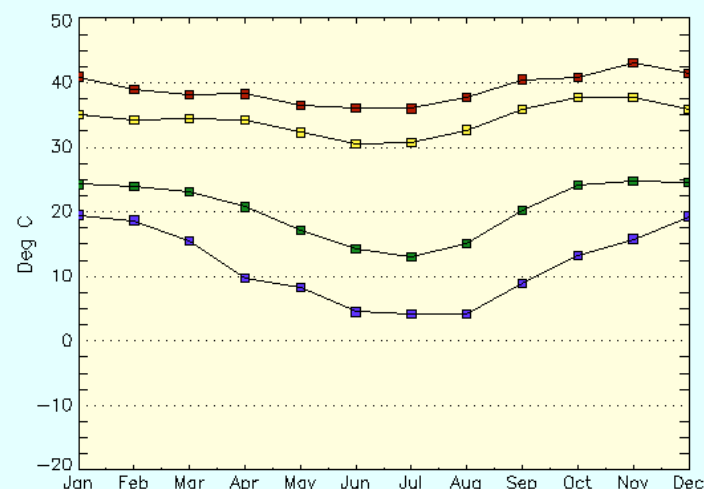


Monthly rainfall data Katherine Avi. Museum



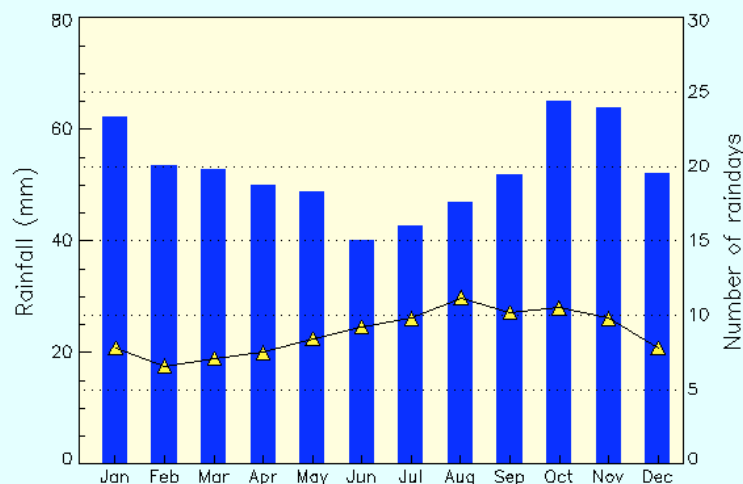
■ Ave. monthly rainfall ▲ Number of raindays

Monthly Temperatures Katherine Avi. Museum



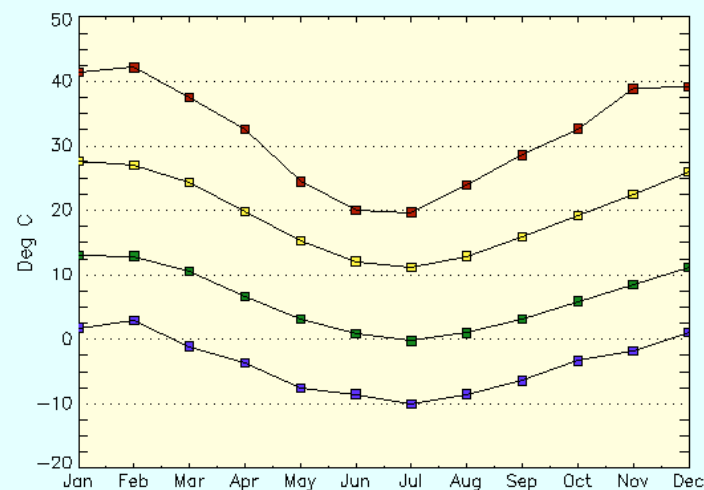
■ Highest Maximum ■ Lowest Minimum
■ Average Maximum ■ Average Minimum

Monthly rainfall data Canberra Aero



■ Ave. monthly rainfall ▲ Number of raindays

Monthly Temperatures Canberra Aero



■ Highest Maximum ■ Lowest Minimum
■ Average Maximum ■ Average Minimum

Summary

- Initial results show that SLR@KATH is a significant contribution to the current global SLR@VLBI sub-network
- Covariance analysis indicates that over the long term, there is significant contribution to be expected in the rate of T_z , something that requires the simulation of several years of data
- Selecting KATH as one of the “future” sites for the NGN simulations will allow us to verify this from the decadal simulations
- Selection of an alternate site at Mareeba (west of Cairns) alleviates concerns about weather conditions at Katherine while it does not change the simulation results appreciably.