



**Australian Government**  

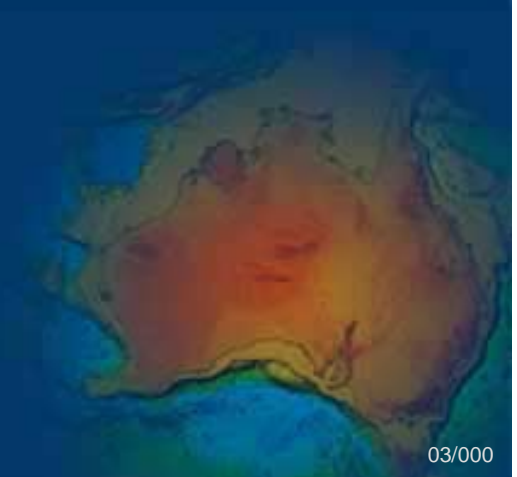
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**Geoscience Australia**

# **An Optimised Global SLR Network for Terrestrial Reference Frame Definition**

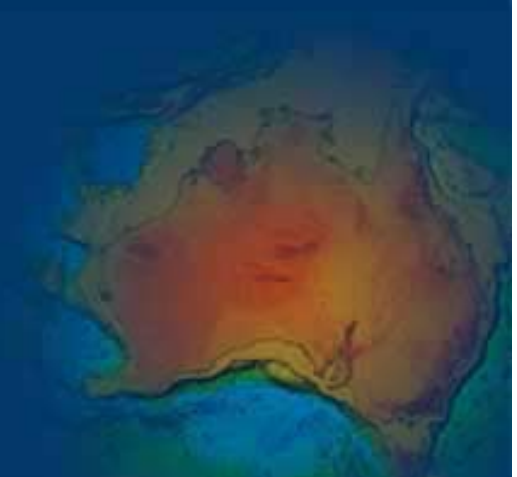
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**15<sup>th</sup> International Laser Ranging Workshop**  
**15<sup>th</sup> – 20<sup>th</sup> October 2006**  
**Canberra**



# Overview

- Introduction
- Baseline Data and Solution
- Simulated Data Set
- COM Results
- Simulation Study Summary
- Global Simulation
- Optimised Network Approach



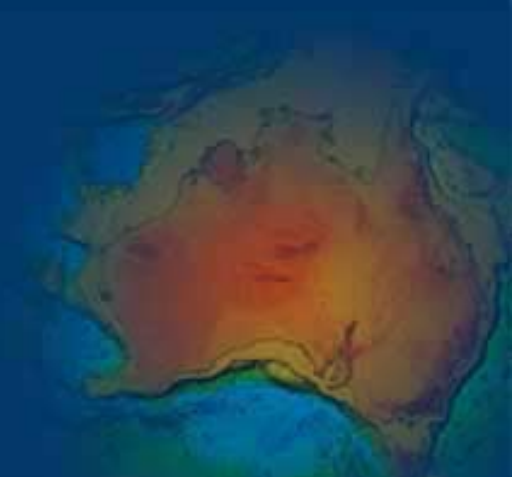
# Introduction

- Study to evaluate the contribution of an additional SLR station in northern Australia
- Measure: Earth Centre of Mass – a primary SLR product
- Site chosen: Tennant Creek
  - Same number of cloud free days as Yaragadee
  - Site options further north are limited by weather



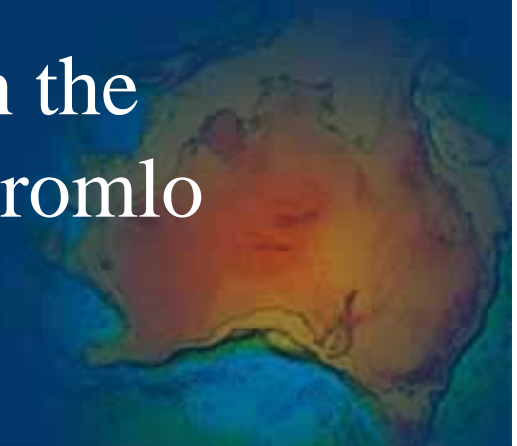
# Baseline Data and Solution

- 2005 Lageos-1, Lageos-2
- 52 Weekly arcs
- Subset of the original 14-year solution from Lageos-1 and Lageos-2 combination



# Simulated Data Set

- Tennant Creek [S19°39'19.5"; E134°11'32.6"; 410.7m]
- Data simulated from the final orbits of the baseline solution for each respective week
- Noise added to the “perfect” data – 10 mm seed – same as the orbit fits for the baseline solution
- Data volume controlled to be within the weekly data from Yaragadee and Stromlo



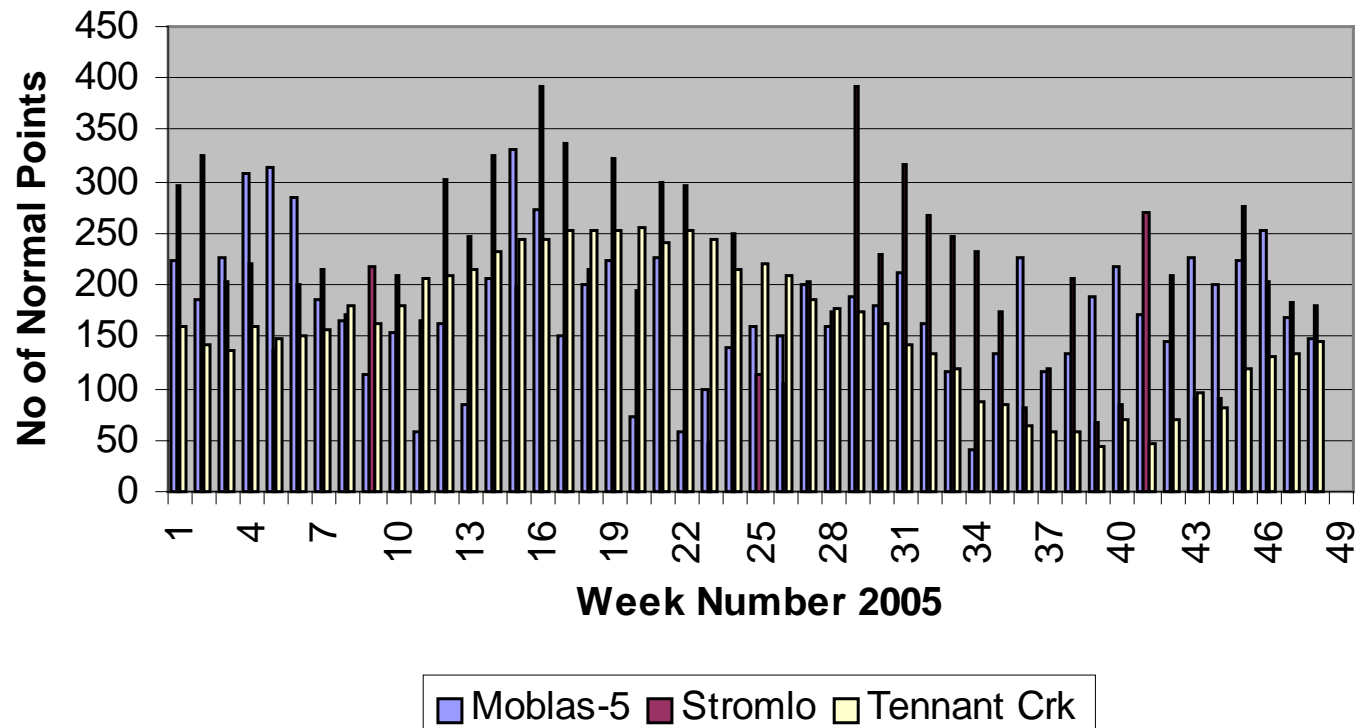
# Simulated Data Set

- Data Volume
  - 5-day week
  - Night operations only
  - 8-hour shift
  - Data losses due to weather not accounted
- Combined the 2 data sets for each weekly solution



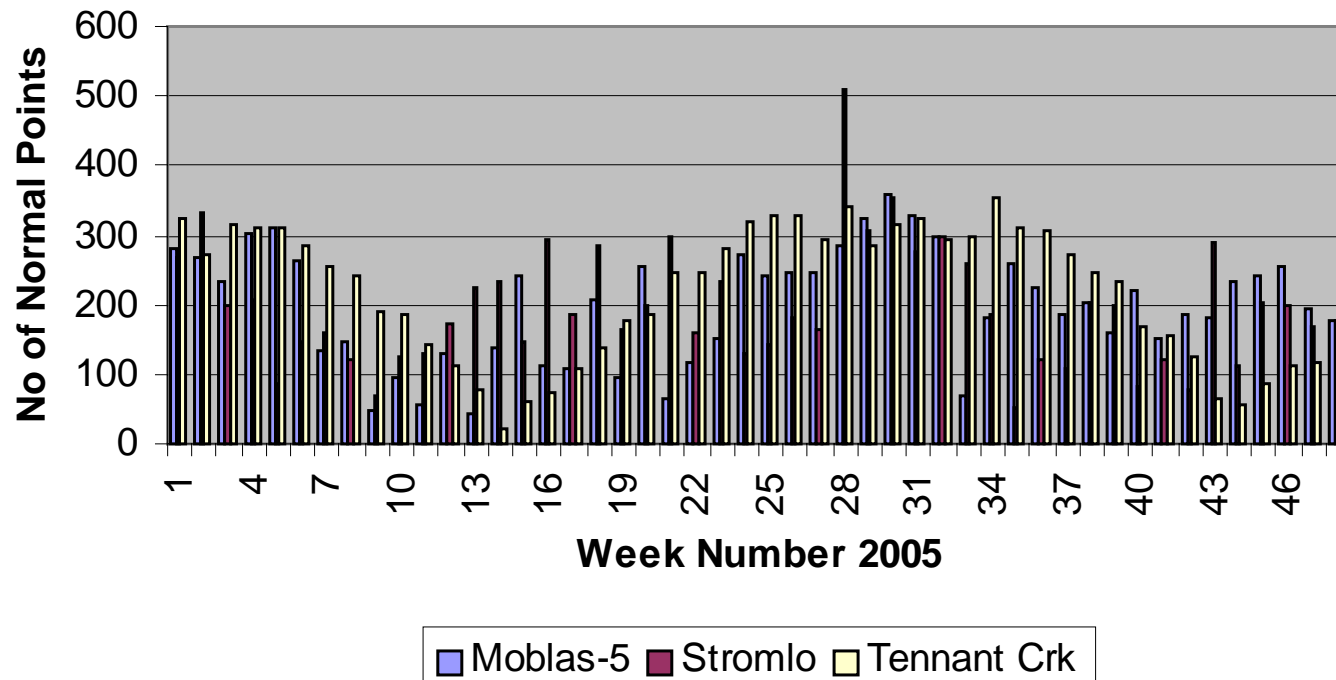
# Simulated Data Set

Lageos-1 No. of Observations



# Simulated Data Set

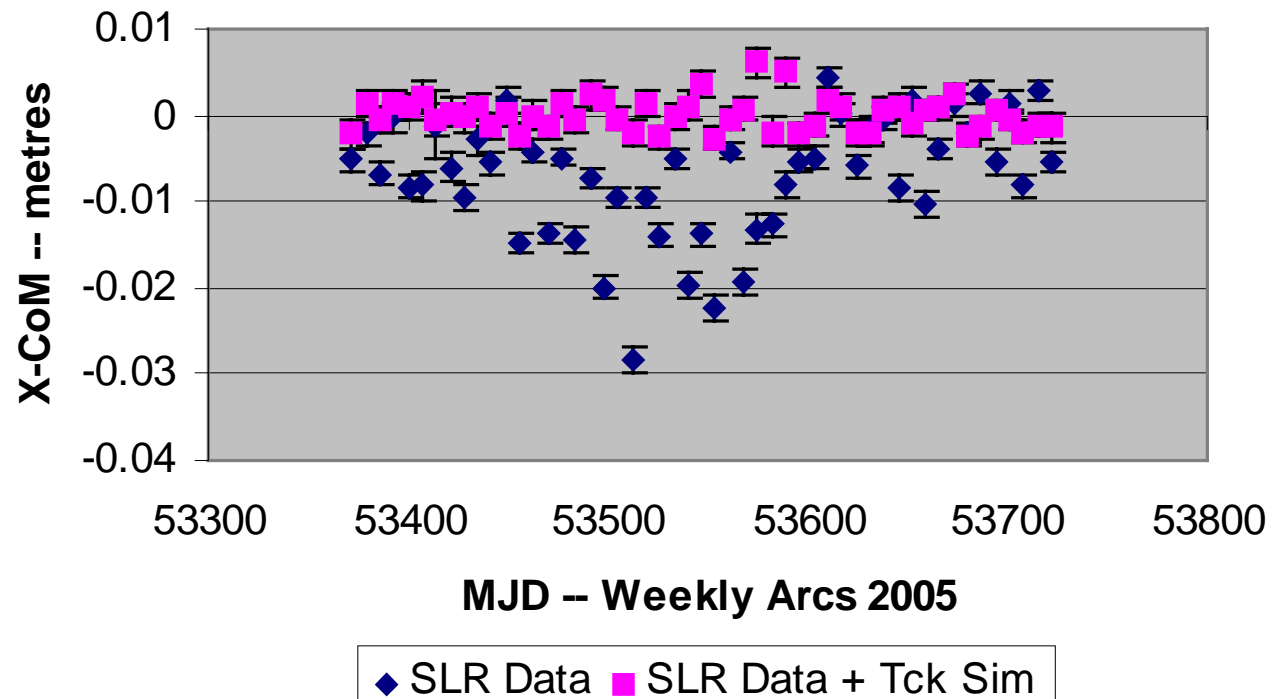
Lageos-2 No. of Observations





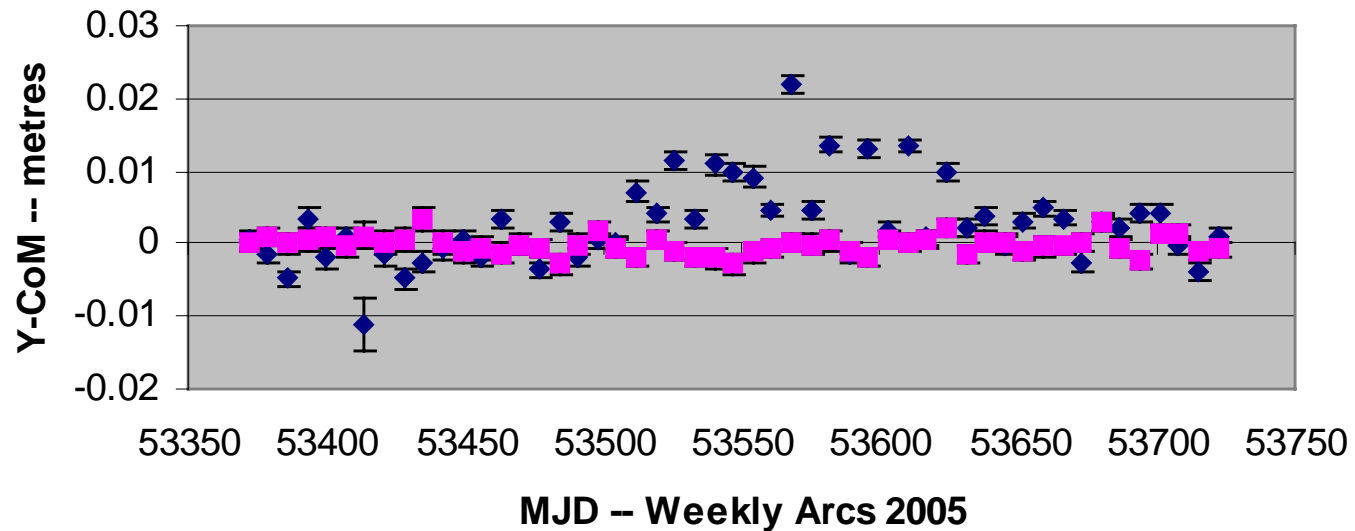
# CoM Results

## X-CoM Tennant Creek Simulated



# CoM Results

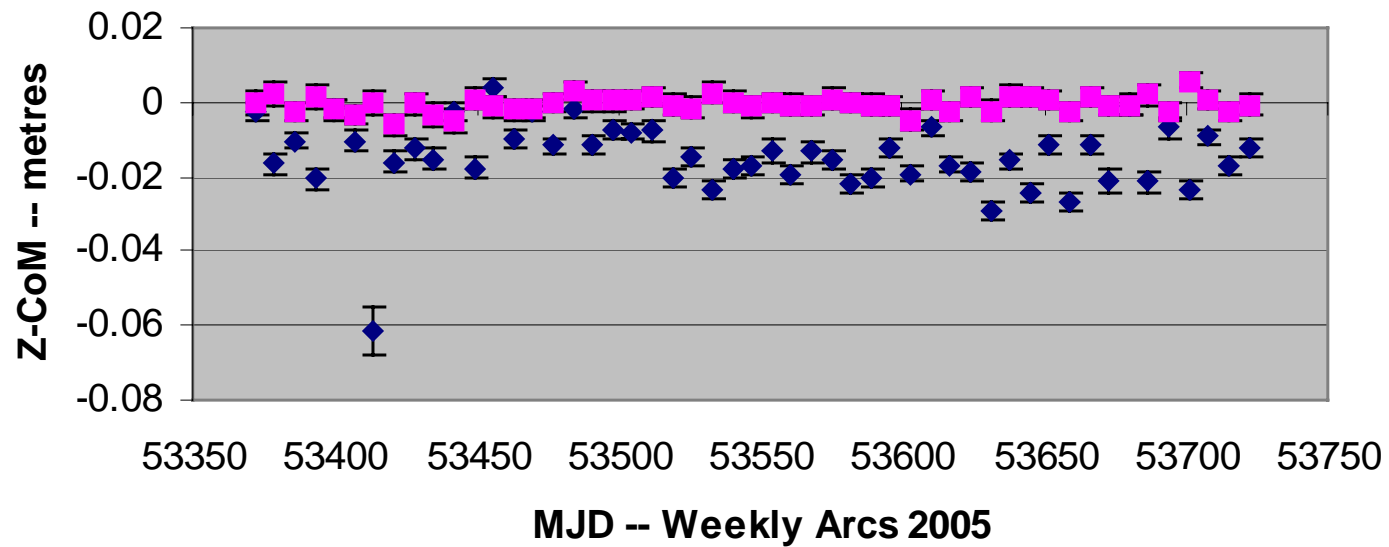
## Y-CoM Tennant Creek Simulated



◆ SLR Data    ■ SLR Data + Tck Sim

# CoM Results

## Z-CoM Tennant Creek Simulated



◆ SLR Data    ■ SLR Data + Tck Sim

# CoM Results

- No “truth” to compare with
- Mean and RMS of the 2 solutions compared

Solution	X-CoM-Mean Mean (RMS); mm	Y-CoM-Mean (RMS); mm	Z-CoM-Mean (RMS); mm
Baseline	-1 (6)	2 (6)	-10 (10)
Simulated	0 (2)	0 (1)	0 (2)

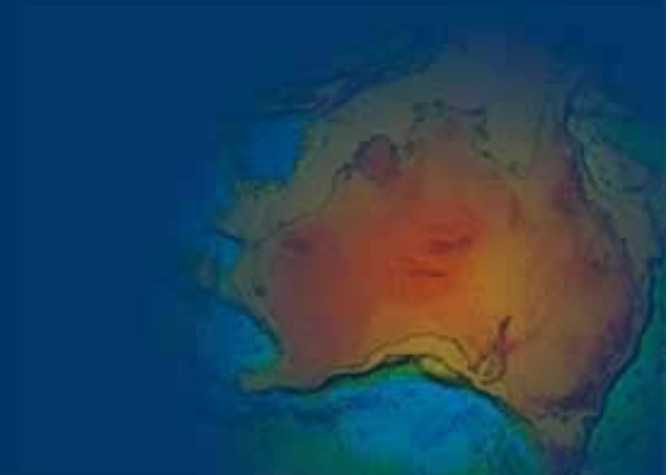
# Simulation Study Summary

- additional SLR station in Australia (in the vicinity of Tennant Creek) and,
- operating at the same levels of productivity and precision as Mount Stromlo and Moblas-5)
- change in the determination of the Earth's CoM by 7mm, -3mm 13mm in the X, Y, and Z components and, more importantly,
- showing a week-to-week consistency in the estimates.

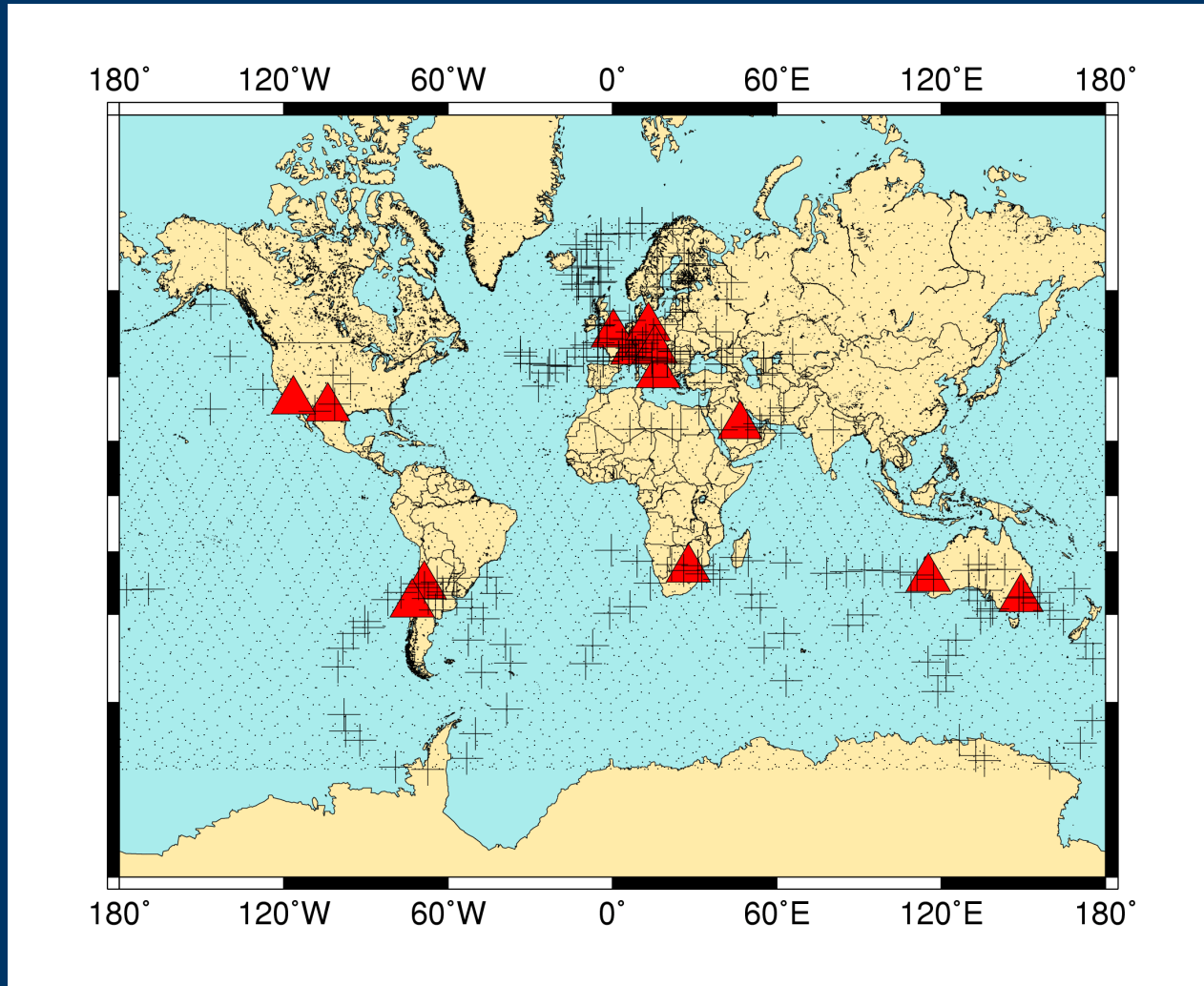


# Global Simulation

- New Approach for an optimised global network
- Structured
- Rational

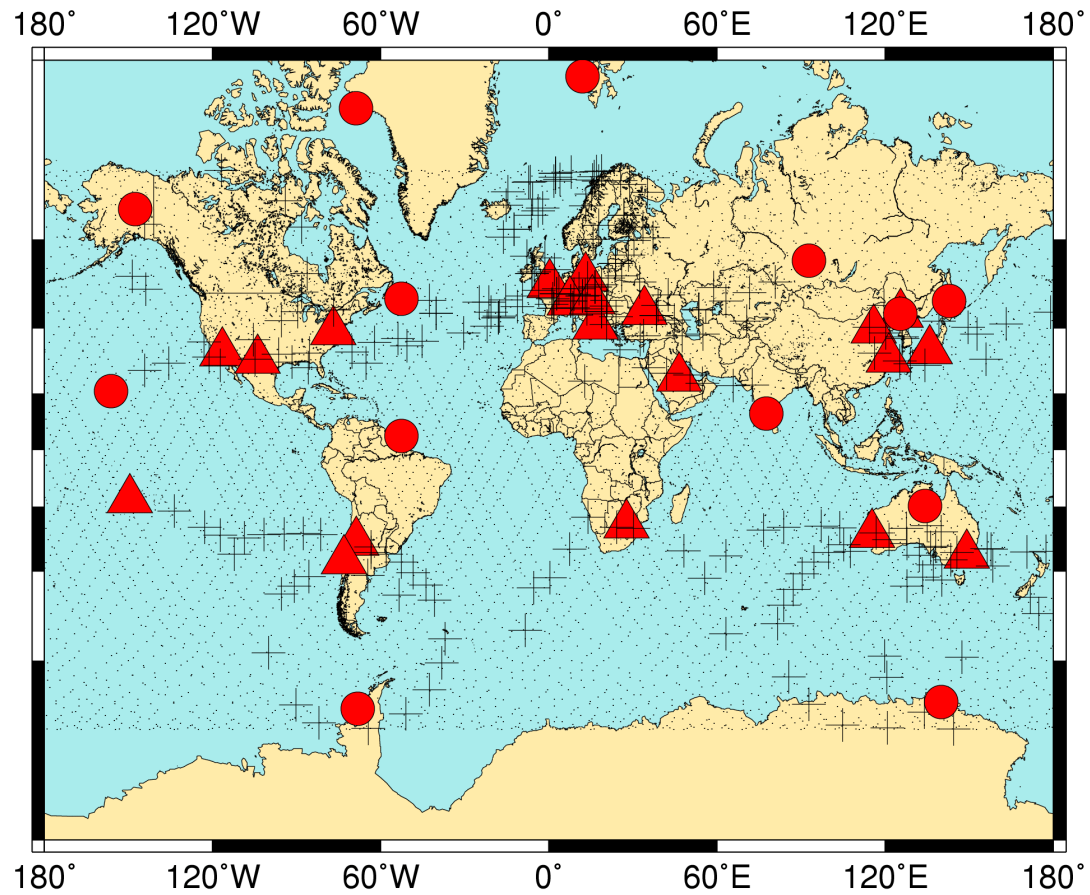


# Lageos-1 Observations Week 060702



*15 observing stations*

# Lageos-1 Observations Week 060917

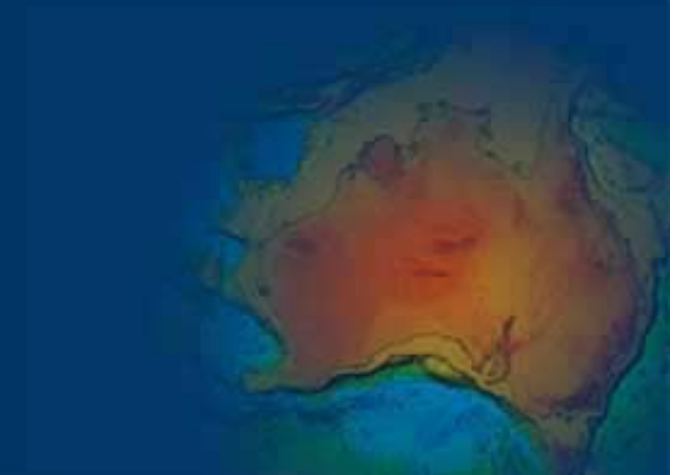


*22 observing stations*

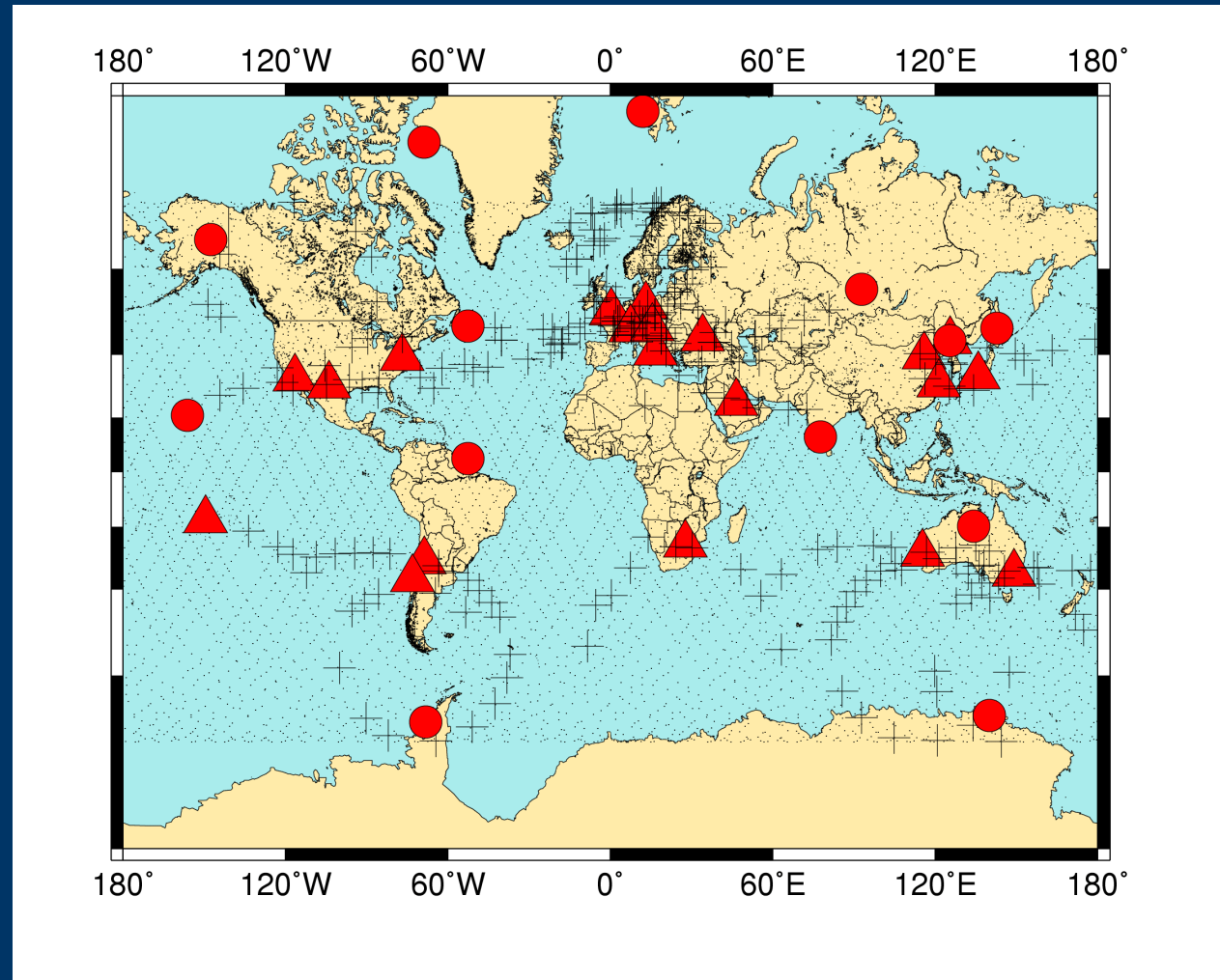


# Optimised Network Approach

- Lack of continuous tracking
- Stability of Geometry -- Changing network



# Simulated Sites -- Distribution



*22 observing stations*

# Optimised Network

- Current status
  - Simulated Lageos-1, Lageos-2 data for 11 stations for all of 2005
  - First priorities in the study – Hawaii and Bangalore
  - Computations being done
  - Results pending

