

# IGS Infrastructure Confronting Challenges

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# WS2008 Infrastructure Recommendations



- Consider active/inactive stations in RF realization
- New IGS Stations only ant+radome with absolute calibration
- No more converted Calibrations into ANTEX
- Station Managers to notify station changes
- Study how to define and certify an RF-quality station
- Accumulation of streams for 15 minute 1Hz files
- Coordinate with UNAVCO on teqc

- Increase site pictures (marginally)
- IGS to provide PPP and other support to stations
- C2 availability, 1/4 cycle phase offset
- Protocol on IGS information exchange
- Coordinate with other networks on common stations
- Develop “network of networks” concept
- Experiment with a Supersite

# Communicating better with Station Operators



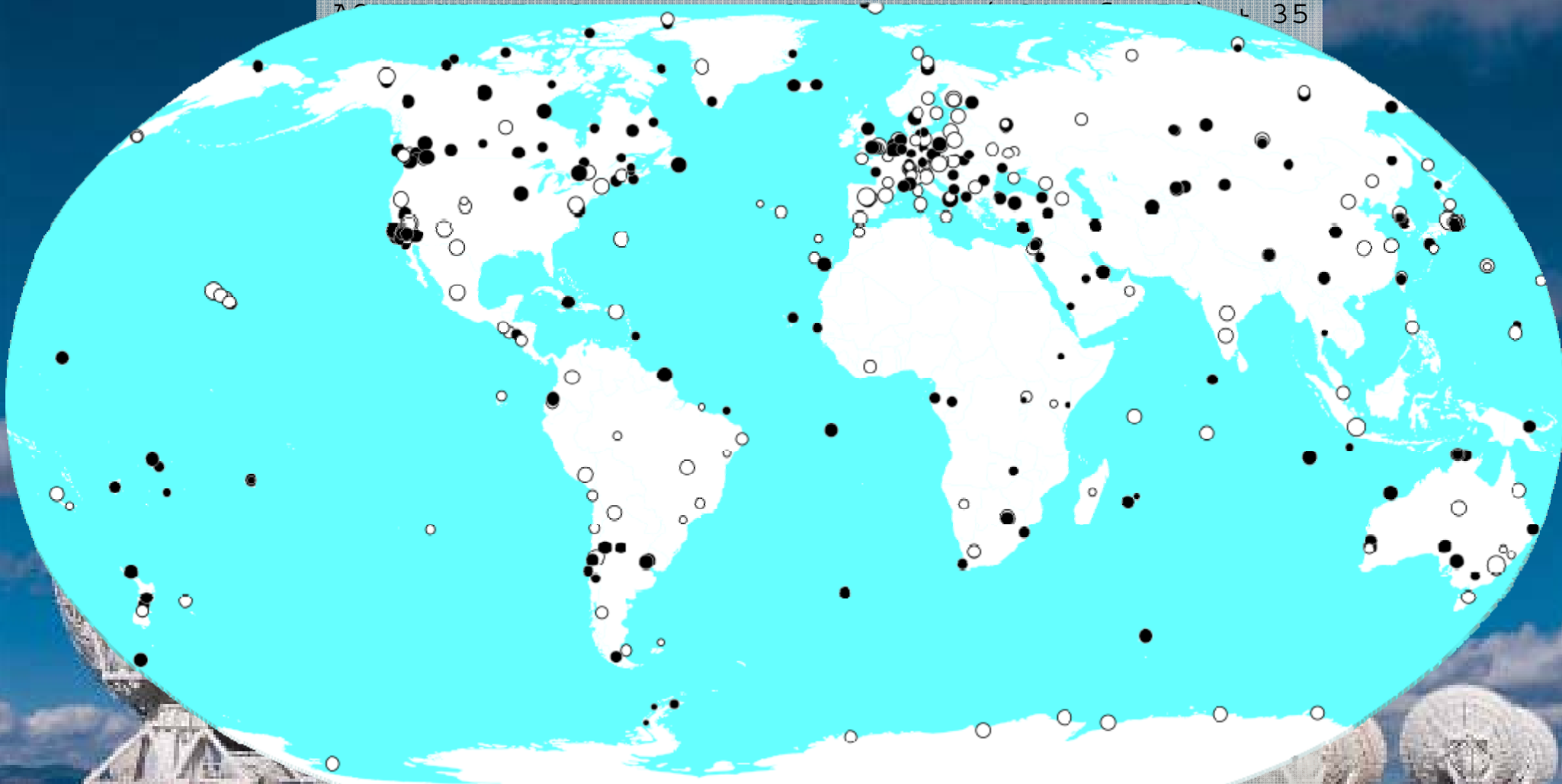
- Established an SO mailing list for the CB and the IC
- Sent message about IGS05 station attrition rate
- Sent AIV message with receiver instructions
- Communications will be few and very targeted

# AIV tracking

AOA BENCHMARK ACT : 100.0% AIV ( 12 of 12)

AOA SNR- : 100.0% AIV ( 6 of 6)

76 : 100.0% AIV ( 35 of 35)

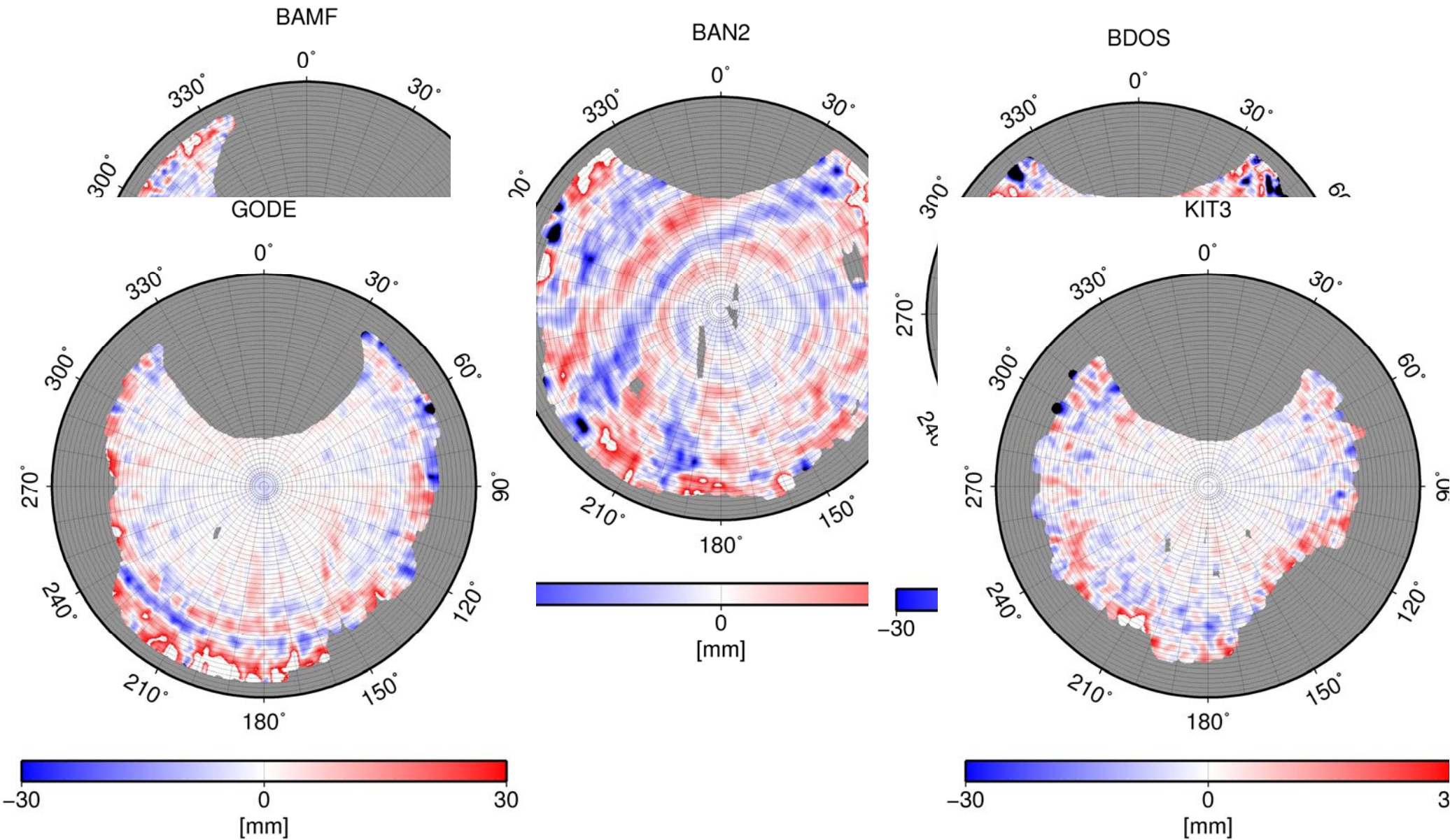


local (possible) : 70.0% AIV (202 of 300)

courtesy S. Schaer

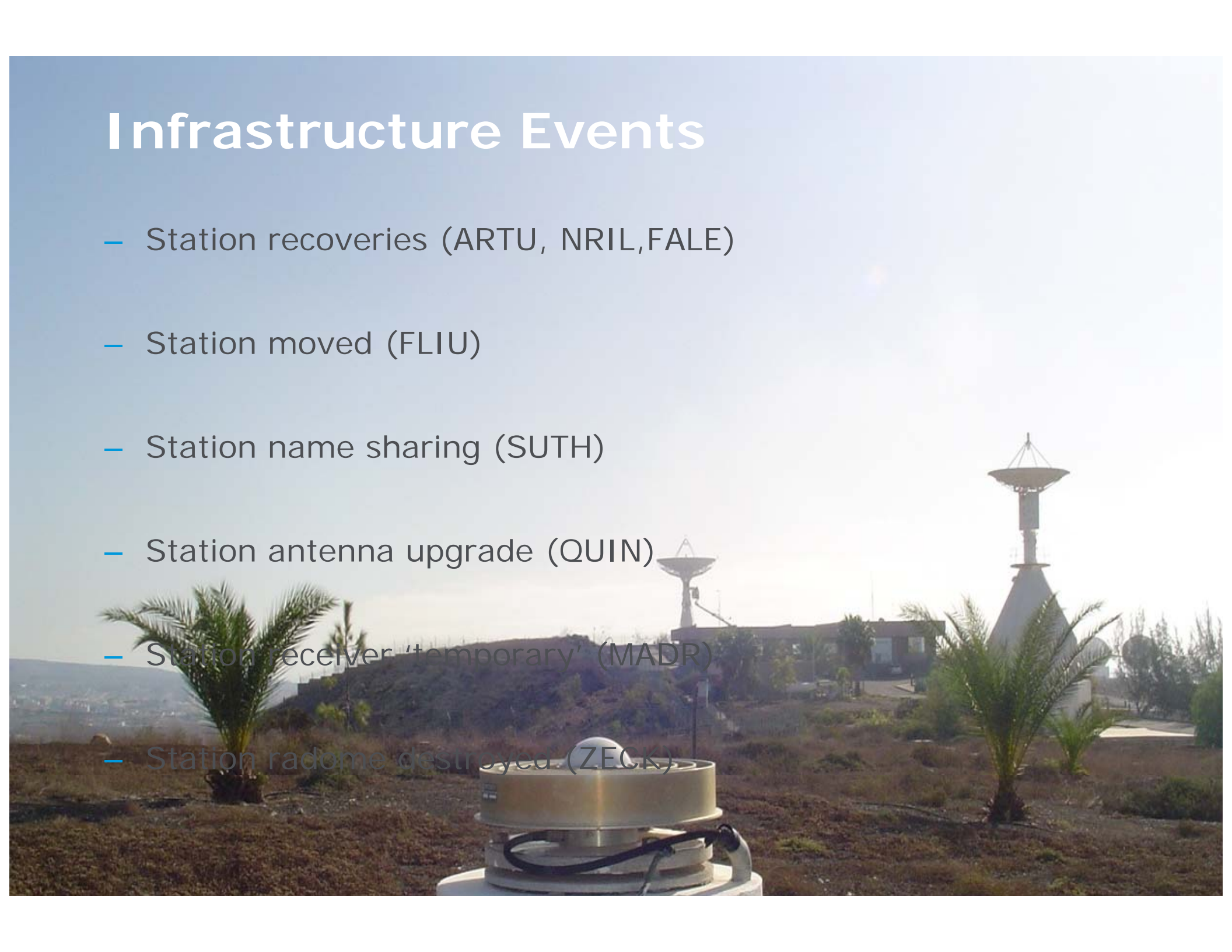
# Better Station Understanding

## IGS Station "Fingerprints" (Huismann, Marel, Teunissen, 2009)



# Infrastructure Events

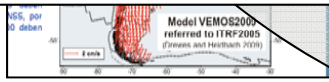
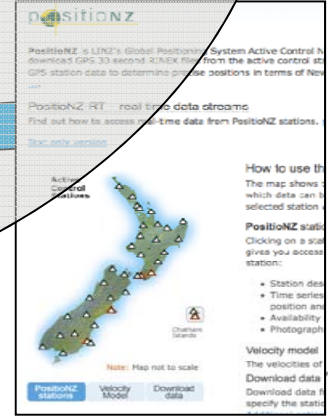
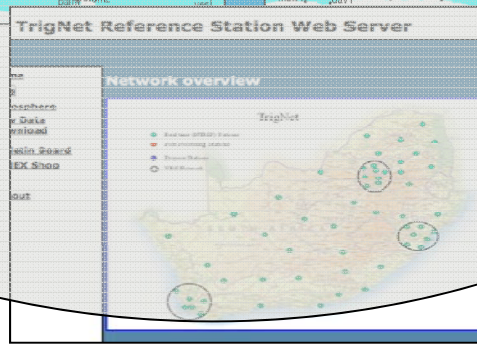
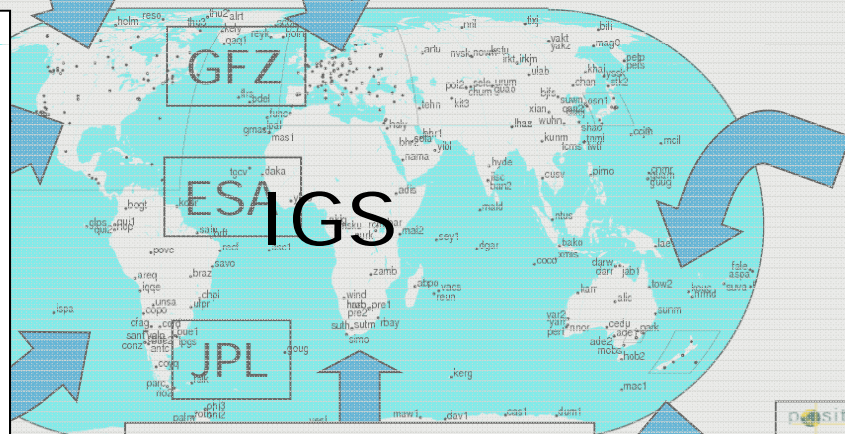
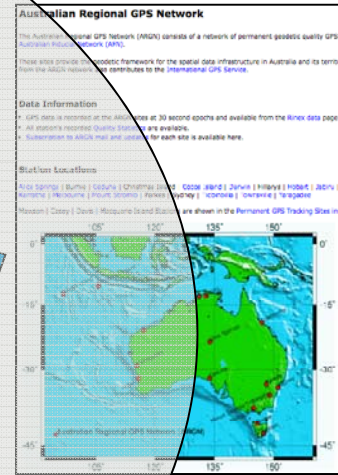
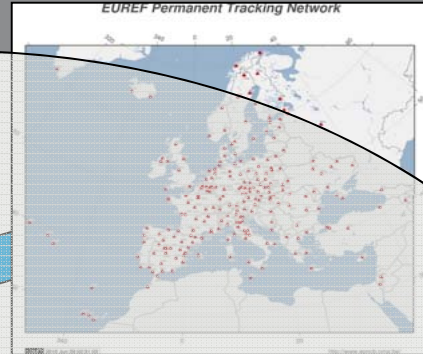
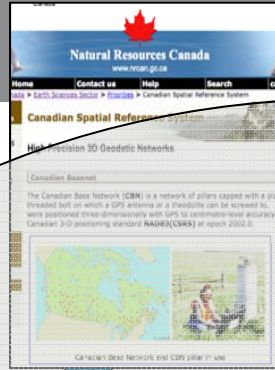
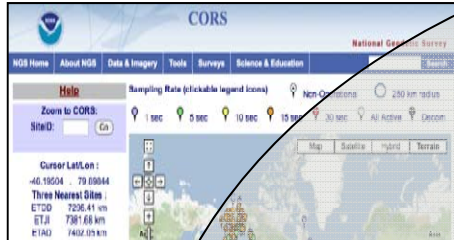
- Station recoveries (ARTU, NRIL,FALE)
- Station moved (FLIU)
- Station name sharing (SUTH)
- Station antenna upgrade (QUIN)
- Station receiver 'temporary' (MADR)
- Station radome destroyed (ZECK)





# Network of networks

- 4 char IDs
- temp DOMES #
- RT Data Streams
- Ant Calibrations



# Station Guidelines



- Organizing, Simplifying
- Important “Station Upgrade Guidelines”:
  - Parallel data on other ‘good’ monument
  - If old monument bad ‘destroy’
  - Uncalibrated ant+radome available to IGS for calibration
  - Local tie surveyed

## What can the IGS offer to the SO?

- Rigorous analysis of parallel data
- Help calibrating old antenna
- ...

## 2. General Station Guidelines

This section presents in table form the guidelines for an IGS station. These guidelines are applicable both to current active IGS stations and to stations proposed into the network.

While it is clear that full compliance with these guidelines is desired it is likely that there may be certain guidelines that a station cannot comply with. It is expected that Station Operators/Managers take the table of guidelines below and use it as a checklist for their own stations and inform the IGS which guidelines may be problematic.

### 2.1. Strict Station

The IGS relies on many of these contributions to be important.

To accept and retain a G monument observed by the station of All stations (new and existing) upgrade and operations.

(NOTE: several guidelines the original sections have traceability reasons to provide

Guideline N°	
2.1.1	Station d in the ds
2.1.2	Site loca changes future (n
2.1.3	The Stat operation
3.1.3	The Stat Geodetic
3.1.4	The Stat
2.1.4	Every effi configur



Fig. 4 This view of the BRF1 antenna and mount, taken during its installation in September 2005, is towards north. The steel tripod stands about 1.5 m tall up to the bottom connection plate.



Fig. 5 Photograph showing a close-up view of the tripod top, SCIGN leveling mount, and Leica LEIAT504 chocking antenna.

Thermal expansion of the building itself should be a larger effect.

#### Other equipment

The BRF1 receiver is a Leica GRX1200PRO model (s/n 452719), which receives a 5-MHz frequency reference from the local Sigma Tau H-maser. A single 36-m segment of Andrew LDF4-30 helix cable connects the antenna to the receiver. This cable type was chosen due to its very low thermal sensitivity (about 0.041 ps/K/m), about an order of magnitude less than RG-type cables. Observations began on 6 September 2005.

Table 1 The configurations and data metrics for the two GPS stations at Fortaleza

Aspect	FORT	BRFT
DOMES no.	41602M001	41602M002
Install date	13 May 1993	6 September 2005
Monument	Dimpled steel disk on roof of one-story building	Dimpled point within SCIGN leveling mount
Mount	Aluminum backplane braced to roof and parapet	1.5-m tall steel tripod on roof of one-story building
Antenna	AGAD-M TA NGS	LEIAT504
Radome	Conical (uncalibrated)	None
Hgt offset	0.043 m	0.0003 m
Receiver	ROGUE SNR-8000	LEICA GRX1200PRO
Firmware	3.2.32.11	2.12
Clock	External Sigma Tau H-maser	External Sigma Tau H-maser
No. overlap days	111	154
Main no. obs	18610	20970
Main ddsat	2503.0	1.4
Mean % usable	67.1	88.9
Mean MPI (m)	0.32	0.28
Mean MP2 (m)	0.98	0.84
Mean slips	49.6	61.5

Both stations are located near different corners on the rooftop of a one-story central building at the RFIN facility. The period of data overlap considered here is 17 September 2005 to 18 February 2006. Mean daily TEQC statistics are computed over this period and shown in the bottom seven lines (assuming an elevation cutoff of 10°).

#### Comparisons of data quality

##### TEQC metrics

Table 1 compares salient attributes of the FORT and BRF1 systems, together with mean data quality statistics computed over the period 17 September 2005 to 18 February 2006. The TEQC utility from UNAVCO (Estey and Meertens 1999) was used for the quality assessment. There were 111 complete 24-h RINEX files for FORT and 154 files for BRF1 considered in the comparison. The poorer recovery of FORT data was due to greater communication problems with the old TurboRogue receiver. About 45% more usable (complete dual-frequency) observations are produced on average each day by the new BRF1 Leica receiver as the FORT TurboRogue (using an elevation angle cutoff of 10° for both). This can be ascribed to the greater number of channels of the Leica (12) compared with the TurboRogue (8) and the much lower poor data rejection rate of the former. Interestingly, the number of phase cycle slips per day is somewhat larger for the Leica receiver. These occur almost exclusively below 15° elevation and might be caused by the two tall radio towers on the site (see Fig. 6 for a view of one tower in the background). It is unlikely that the multipath RMS statistics

THANK YOU

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IGS Infrastructure: Accomplishments and Challenges

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