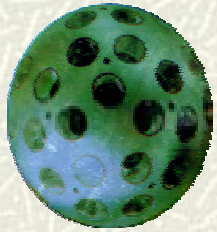
Engineering Data File

Motivation



- SLR should be THE geodesy scale !!!
- But: Is it as strong as it could be ?
- Where are our weaknesses ?
  - Range Biases ?
  - Stability ?
  - Accuracy ? Volume ? Coverage ?
  - Or ALL of that ? ☺

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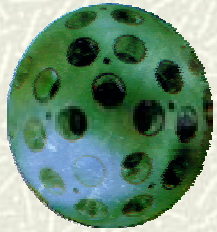
What we would like to see ...



- **General Goals for ALL Stations:**
  - **No Range Biases (at ANY station);**
  - **Adequate Long Term Stability;**
  - **1 mm accuracy;**

➔ **We would like to see:**
the perfect, unbiased SLR Network ☺ ....

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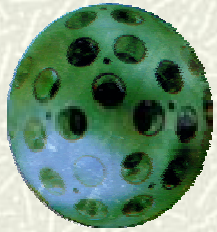
What are we doing now ?



- We do a lot of routine calibrations;
- We do some internal Engineering Tests;
- We rely on Orbital Analysis;
- We wait until some Analysis Group detects some problems ... ☺

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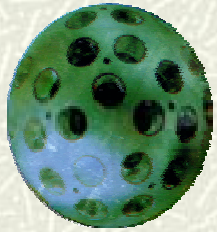
What are we doing now ?



- We do a lot of Calibrations:
  - Routine Cals; Graz: Many params stored;
  - Checked internally for consistency;
  - Main params checked by Van also;
- BUT:
  - MORE params should be stored / checked;
  - Compare params with OTHER Stations:
    - Similar hardware should give similar results!

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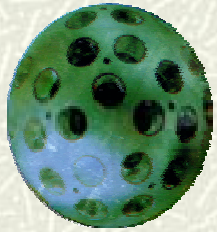
What are we doing now ?



- **We rely on Orbital Analysis:**
  - **Detects Range Biases of some cm „ONLY“;**
  - **Detects other Errors NOT seen at stations;**
  - **Does NOT detect lower level Range Biases;**
    - **Different results (at some cm level);**
    - **Difficult (or too late) to detect drifts;**
  - **Suffers if poor coverage, low pass counts;**
  - **No initial correlation with setup changes...**

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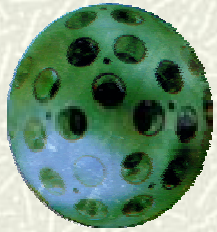
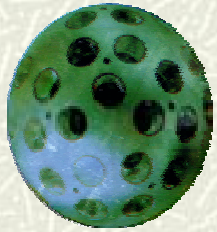
What would we like to see ?



- Drifts, Changes, Jumps at the few mm-Level
  - Not – yet - possible with orbit analysis;
- See that all even with low pass counts !
- Improve systems with PRESENT hardware !

Engineering Data File

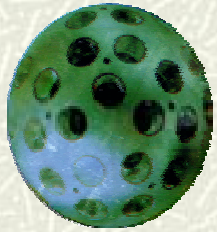
PROPOSAL



- Create a standard Engineering Data File;
- Store all relevant / interesting data in it, as
  - collected mainly during calibrations;
  - Use some standard format for that file;
- Check consistency / continuity of YOUR data;
- Make the data available to the community;
- Check / compare with data of OTHER stations;

Engineering Data File

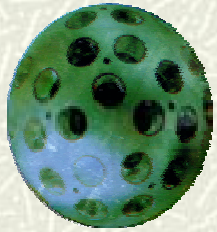
What should this file contain ?



- ALL Calibration details;
  - Epoch, Range, RMS, P-M, Skew, Kurtosis ...
- Meteorological data
- System: Temperature (Lab, Laser, Timer etc.); Laser Power, settings / trigger levels etc.;
- Event Timers: Channel offsets, epoch syncs, epoch ref. source, frequency ref. source etc.
- Counters: All relevant settings;
- etc., etc., etc. ...

Engineering Data File

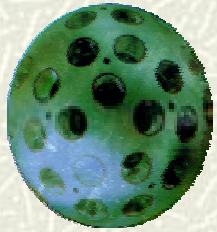
Expected Output



- Continuous system history for many params:
  - NOT ONLY THE CAL / RMS values ...
- Quick (Automatic?) detection of drifts, jumps,
  - degradation effects etc.;
- Correlation of system data with bias reports based on orbit analysis
- Comparison with other stations: Identify your capabilities with present hardware

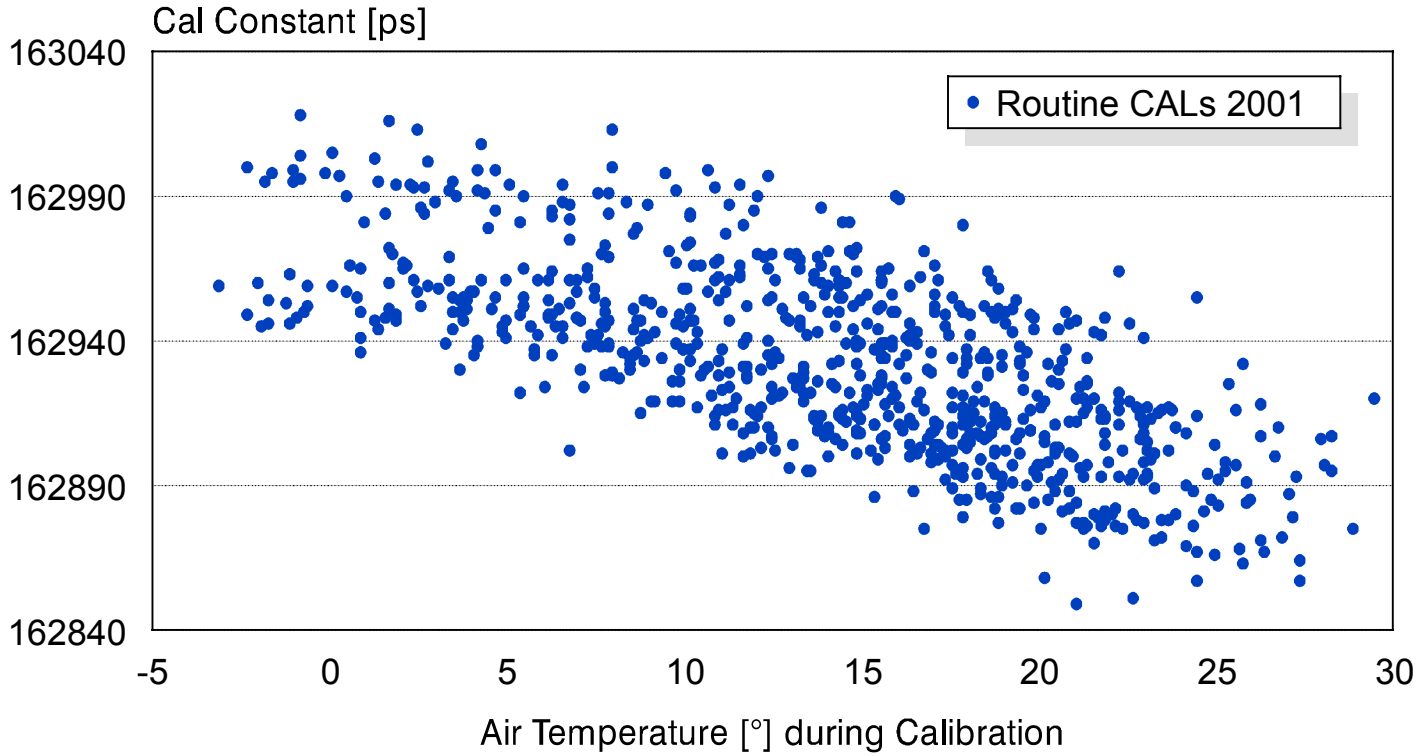
Engineering Data File

Example 1: See Temperature Drifts



SLR GRAZ: Cal File

CAL Constant vs. Air Temperature



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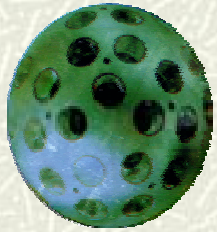
Example 2: Identify Improvements



- Station A and B: SAME Hardware, BUT:
- The Engineering Data Files shows you:
  - A: 30 ps RMS on Cal, stable
  - B: 45 ps RMS on Cal, variations
- Compare both engineering data files:
  - It shows e.g. a simple procedure problem;
  - With little effort, B can improve to 30 ps !

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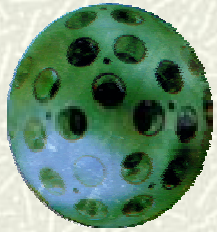
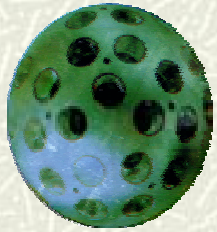
Example 3: Station Comparisons



- Graz & Wettzell use similar Event Timers;
- E.T. Module offsets are measured before pass;
- Wettzell: Offset varies 10-15 ps
- Graz: Offset varies 3-4 ps, more stable
- Reason: Single / Averaged measurements
- Simple Comparison of Engineering Data:
  - Shows that data should be better;
  - Simple change of procedure ...

Engineering Data File

How to start it ?



- Suggestion for a first test phase:
  - An initial format is discussed, defined;
  - Graz + few other stations: Start with it !
  - At October 2003 meeting: Enough data for first evaluation, additions, corrections etc.
  - Somebody of the NEWG (Van ?) looks at the data files, checks, plots etc.
  - Automated checks could detect jumps, drifts etc.