Site Surveys & Co-Location Sites
IERS-WG Meeting

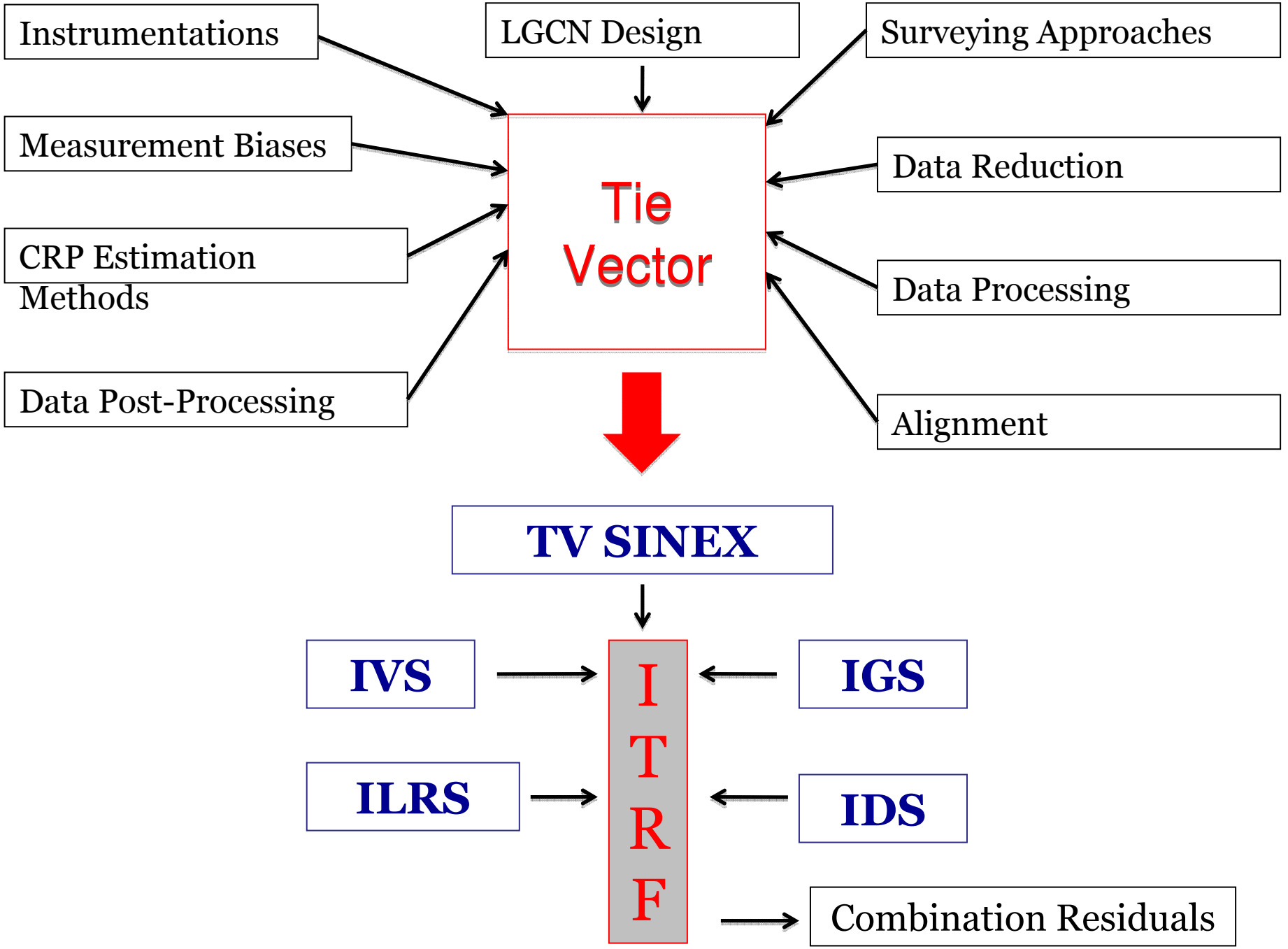
AGU Fall Meeting, 2011, 7 December, 2011
Westin SF, Market Street, Civic Room, 50 Third Str.

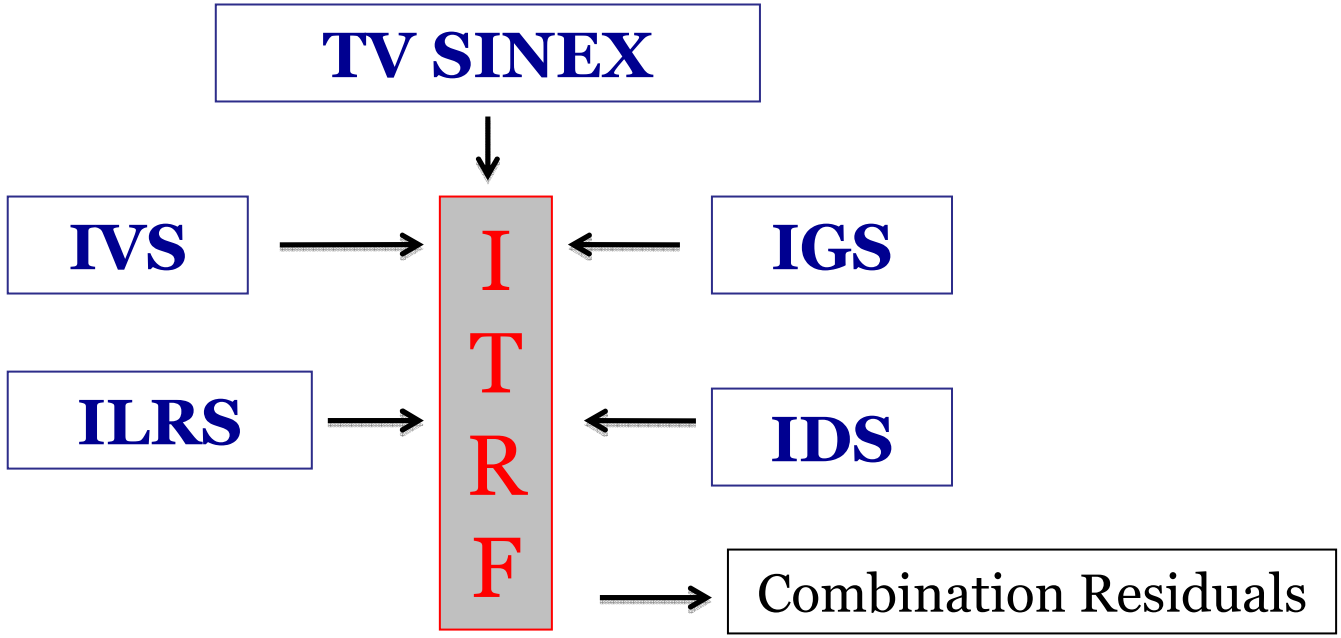
- Apologies for the very late notice
- My personal thanks to those who could find time and interest to take part
- 3rd meeting of the WG since 2008
- Recall LT fundamentals and their connections to TV productions
- On Friday 9th G51B-02 comprehensive review of the error budget of a TV
- Contributions of several factors
- Critical aspects: there are no reliable indicators of the quality of TVs
- TV production based on Sparse actions and Inhomogeneuous approaches
- Missing central repository and coordination
- Proposal

- All the information relevant to classical survey
  - Permanent Site Information
    - Site monographs (location, type of markers..)
    - L(ocal) G(round) C(ontrol) N(etwork) design
    - Station and Occupancy (peculiarities)
    - Geological Features of the Site and monument design and depth
    - …
  - Stacking of Site Information
    - Raw Survey Data and Instrumentation
    - Number of survey performed
    - Atmospheric Parameters (Refraction)
    - Geoidal Undulation and Vertical Deflection
    - …
  - Site Output
    - Results of surveys in topocentric and global RS
    - Alignment Information
    - Processing approach and software
    - SINEX file
    - …

Definitions

- Space Geodetic (SG) instrument Reference Point (RP):
  - Conventional RP (CRP): the geometric RP
    - **VLBI and SLR**: the projection (intersection) of the mobile axis onto (and) the fixed axis
    - **GPS (DORIS)**: the antenna (beacon) reference point
  - Electronic RP (ERP): the physical RP where the SG observable is acquired
    - **VLBI (SLR)**: the radio telescope feed horn phase centre (the telescope photo detector)
    - **GPS (DORIS)**: the antenna (beacon) reference point
- Tie Vector (TV): a vector aligned with the ITRF containing the coordinates of the co-located space geodetic instruments CRPs
- Local Tie (LT): the surveying process of a Tie Vector *usually* based on terrestrial (optical) measurements (trilateration, triangulation, high precision spirit levelling)
- Co-location site: a geodetic site where two or more permanent SG instruments acquire observations; actual separations: $\approx(10 \div 10^4)$m
- Surveying method:
  - Direct: the CRP is materialized with a target
  - Indirect: the position of the CRP is retrieved applying geometric conditions to ancillary targets
  - Hybrid: a mixture of the previous methods


Instrumentations
LGCN Design
Surveying Approaches
Measurement Biases
Tie Vector
Data Reduction
CRP Estimation Methods
Data Processing
Data Post-Processing
Alignment
TV SINEX
IVS
IGS
ILRS
IDS
ITRF
Combination Residuals


TV SINEX
IVS
IGS
ILRS
IDS
ITRF
Combination Residuals

- Are the combination residuals a useful metric for detecting **technique-specific biases**?
- **NO!** (masking and redistribution effects of the LS)
- A few examples….

  1. Medicina (VLBI-GPS)
  2. Tsukuba (VLBI-GPS) -> Paul Rebischung
  3. Yaragadee (SLR-GPS) -> Gary Johnston
  4. Yebes (VLBI-GPS) (?????)

Examples of combination residuals

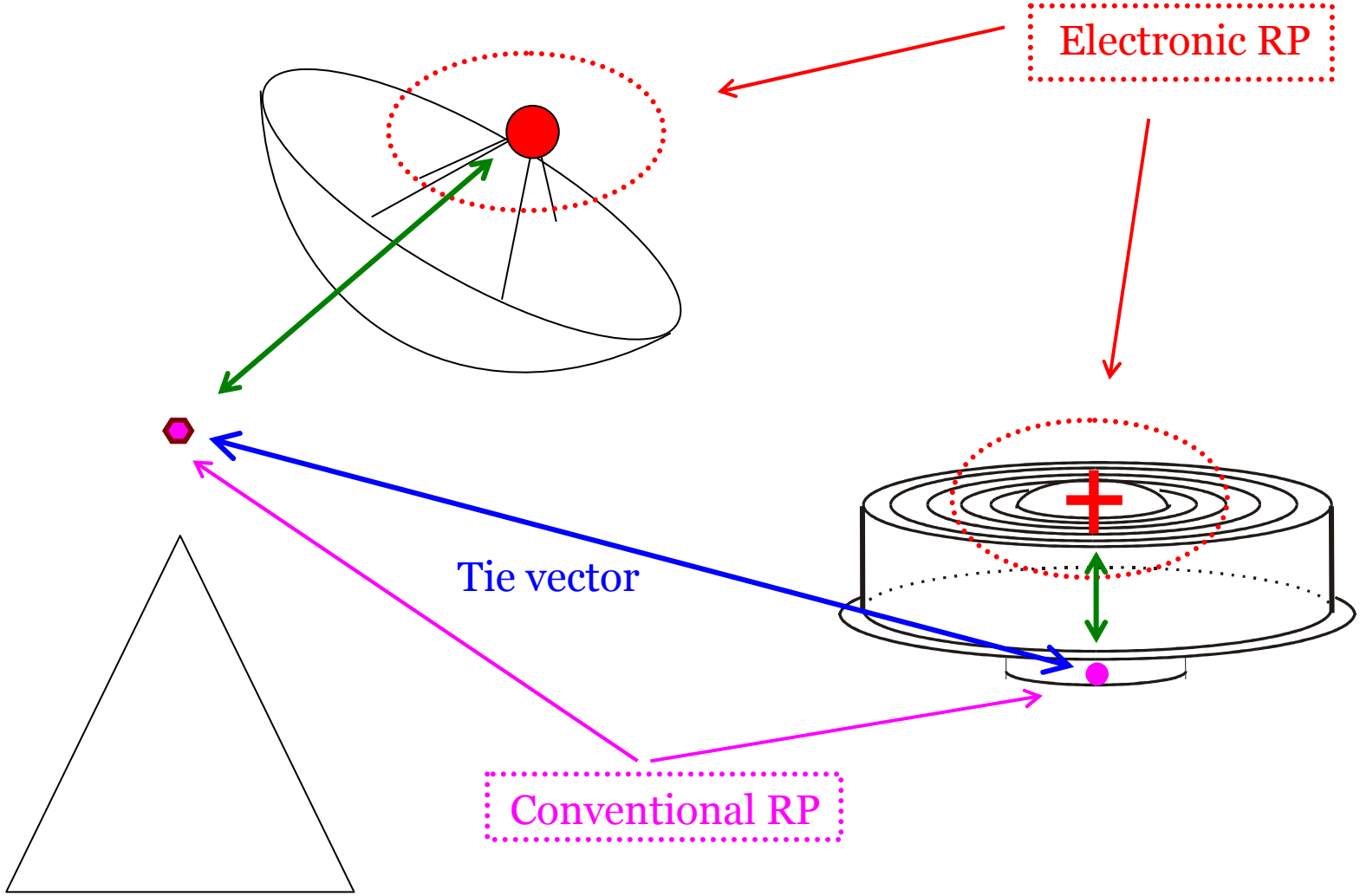
Residual = (SG) – (TV)

		ResN	ResE	ResU	ResD (mm)
• 12711M003	12711S001	-2.4	-2.7	**6.3**	-1.2
• 50107M004	50107M001	3.3	-1.9	**14.4**	-3.7

TSUKUBA

YEBES

The ERP mapping onto the CRP must be accurately realized in the SG data analysis:
Phase Centres Variation files or Signal Path Variation files ; thermal models



Conclusions

- A Working Group is not effective enough to face such a complex situation
- Indeed, the problem does not limit to the geometrical link btw CRPs and survey issues
- Given the role of TVs in Frame combinations and beyond, the **establishment of a new IAG service** devoted to site surveys would be a wise and effective choice to step forward
- Proper actions must be undertaken