IAA Space Geodetic Software

I. Gayazov, V. Gubanov, S. Kurdubov, V. Suvorkin
O. Brattseva

IAA RAS, Saint Petersburg, Russian Federation,
ipa@ipa.nw.ru

- **Techniques:**
  - VLBI (IVS: 24h - weekly, Int - daily)
  - VLBI (Ru: 24h - weekly, 1h - daily)
  - GNSS (IGS, 24h, - daily)
  - SLR (ILRS, 96h - daily)

- **Software:**
  - VLBI: Quasar OCCAM/GROSS
  - GNSS: Grape
  - SLR: GROSS, Grape
  - Combining: SINCom

- Reduction parameters
  - Most calculations done according to the IERS Conventions (2010)
  - Various options
- Single and multi session estimations
- Estimation options
  - Various parameters can be estimated
  - Every parameters can be global, arc or stochastic
  - Every parameters can be estimated as polynomial trends
- Least Square Collocation method
  - Mean correlation function
  - Individual variance values for each station

- Global solution :
  - TRF
  - CRF
  - EOP
  - Coordinate Frames stability research, tidal effects research, etc.
- Daily EOP, sources positions and station coordinates NEQ matrices (SINEX format) for combining
- Ultra-rapid Ru-U processing (UT1)

GRAPE processing software

- Processing strategy is in accordance to IGS and IERS recommendations
- Multi-group LSA technique
- Processing daily GNSS network phase and code measurements of GNSS satellites with 30s sample
- Multi-regime processing
- SINEX products output
- SLR processing (test mode)
- New version launched February 2014

Different combination of fixed and estimated parameters.

- PPP

- Global estimation (fixed stations) with following products:

  - EOP

  - Satellite parameters (r, v, solar pressure)

  - satellites and stations clock biases

  - Troposphere

Daily processing 32 satellites, 50 stations within IGS network, EOP results are provided to IERS:

- Satellites orbits compared to IGS: 25-60mm rms

- EOP, compared to IERS series:
  - 55 µas for pole motion coordinates
  - 13 µs for LOD

- Troposphere: 1.3 mm st.dev compared to IGS

- GROSS :
  - daily EOP data, is provided to IERS
    - Pole motion: st. dev 170 µas
    - LOD: st.dev 25

- GRAPE SLR:
  - Determination of low-degree Geopotential coefficients

- Combined processing of different space geodesy observations

- Estimate EOPs and positions of stations

- Apply constraints

- Fix or pre-eliminate parameters

- Estimate station velocities

- Simple text user interface

- Competitive, powerful and easy-to-use tool
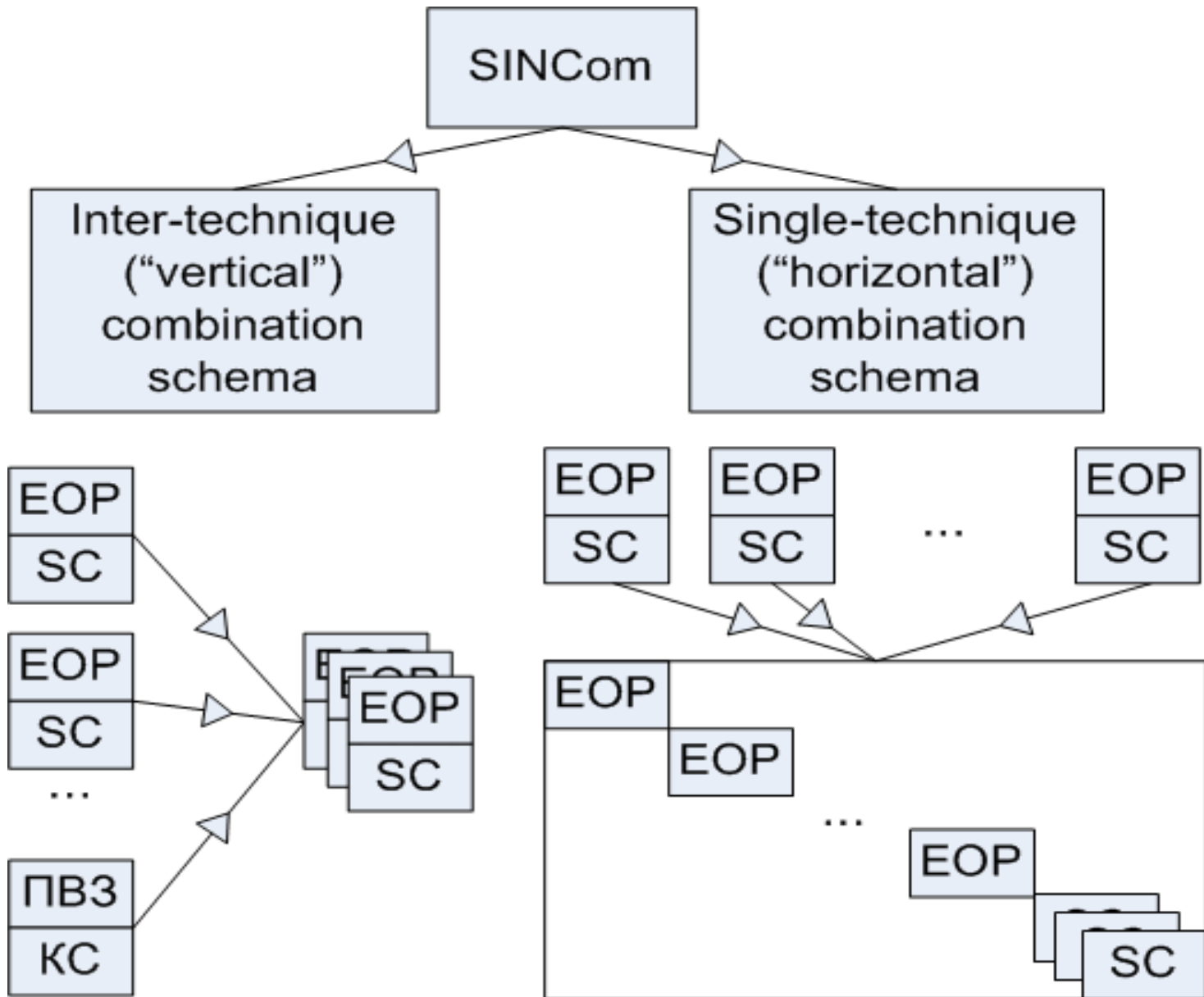
- The horizontal combination scheme was applied to the SINEX files got from SLR observations during 2012-2013 years. Coordinates of stations of the QUASAR network (Svetloe, Zelenchukskaya, Badary) and their velocities were estimated.

- Modernization of GNSS software

- Include SLR measurements to GRAPE

- Regular SINEX output and combined solutions including all techniques