Basics of GPS processing workflow

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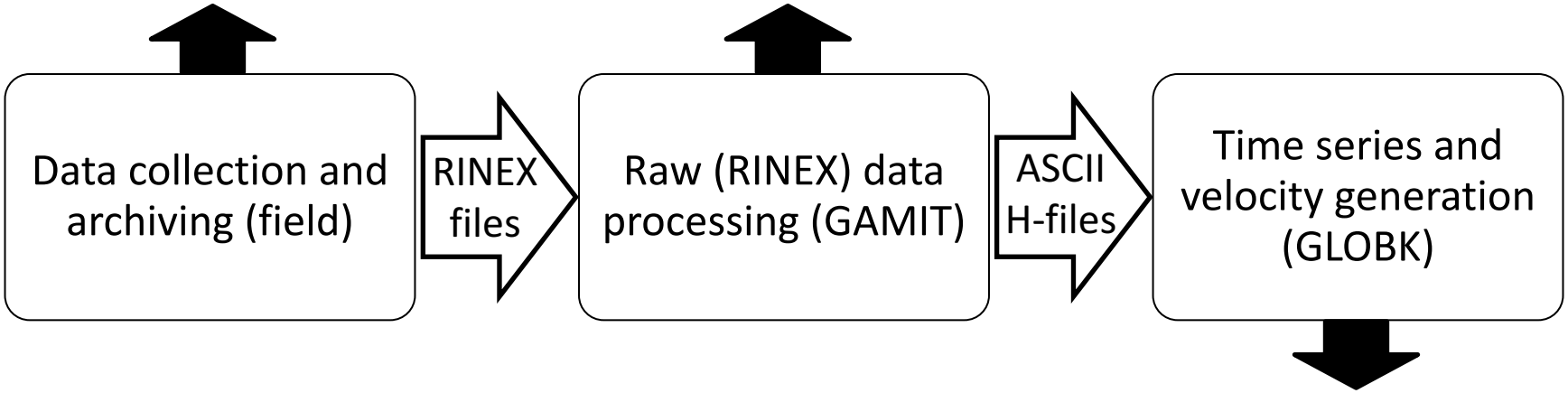
http://web.mit.edu/mfloyd/www/courses/gg/201705_Bristol/

Basic stages of GPS for geoscience

- runpkr00
- teqc
- etc.

- MODEL (model observations)
- AUTCLN (cleans data)
- SOLVE (solve for parameters)



- glred (time series)
- globk (velocities)

Structure

- The scripts that control gamit and globk all have built in help which can be evoked by typing name
  - ~/gg/com contains all of the scripts used
  - ~/gg/gamit/bin and ~/gg/kf/bin contain the program executables
  - kf programs also have help output
  - (gg is a link in your home directory that points to the directory with the gamit/globk software installed)
- Once the software is installed; user selects data to be processed over some interval of time and uses sh_gamit for the processing
- GLOBK is used after the daily processing to combine results and set the reference frame.
- Everyone should have completed the installation of the software at this point
- Running the example case is a good idea to make sure the installation is OK

Basic inputs and outputs

- RINEX data must be prepared for input to GAMIT
- Output for GAMIT and input to GLOBK are ASCII "h-files"
  - Loosely constrained solutions with a priori parameter information, parameters adjustments and full covariance matrices
- Final output of GLOBK is ".org"-file
  - Time series (".pos"-files)
  - Velocities (".vel"-files)

GAMIT

1. Run sh_setup
   - Check all links, especially to grid files (otl.grid, atl.grid, map.grid, met.grid; see sestbl. for what is "switched on")
2. Place RINEX data to be processed in rinex/
   - Except any publicly-available RINEX files one has set to be FTP'd in sites.defaults
3. Prepare *and verify* station.info, e.g. sh_upd_stnfo
4. Prepare *and verify* apr-file, e.g. sh_rx2apr
5. Run sh_gamit

sh_gamit

- `sh_gamit` is the master script for running GAMIT
- The following files are important to verify and/or edit (e.g. after `sh_setup`)
  - autcln.cmd (probably unnecessary to edit)
  - process.defaults (not necessary to edit much, if anything)
  - sestbl. (controls experiment observations and models; defaults OK but may want to edit)
  - sites.defaults (list of sites to process in experiment)
  - sittbl. (controls a priori constraints on sites; probably unnecessary to edit)
  - station.info (*very* important file to get right)
  - .apr-file (*very* important file to get right)
- More detail in a following lecture (first lecture tomorrow)

Processing: GAMIT

- Preprocessing
  - Download (sh_get_orbits) and prepare (sh_sp3fit) orbits
  - Make clock files (MAKEJ)
  - Download (sh_get_rinex) publicly available sites and convert RINEX files to GAMIT internal format (MAKEX)
  - Write batch (“b”) files
- Iterative solution (run b-files)

  - Calculate synthetic observations from a priori parameters and models (MODEL)
  - Create observables (LC, L1+L2, etc.), clean data (AUTCLN)
  - Fit calculated to observed by solving for parameter estimates (SOLVE)
  - Update a priori information if large adjustments

Post-processing: GLOBK

- Convert ASCII h-files to binary h-files (htoglb in glbf/)
- Generate and chronological list of binary h-files (glist in gsoln/)
- At this point, diverge in approach depending on solution sought…

GLOBK short-term combinations

- Combine days from a period over which velocities are negligible, e.g. a 10-day survey, bi-weekly or monthly combinations for continuous GPS
  - Reduces short-term scatter
  - Reduces number of files to be carried forward to velocity solution
- Run glred to generate time series
- Plot time series (sh_plot_pos)
- Inspect time series to identify (and remove) outliers
- Run globk to form one solution file for survey (".org"-file) *without estimating velocities*
  - `apr_site all 10 10 10 0 0 0`

  or
  - `apr_neu all 10 10 10 0 0 0`

GLOBK long-term velocities

- Combine daily (continuous) or short-term combined h-files (e.g. surveys; see last slide)
- Run glred to generate time series
- Plot time series (sh_plot_pos)
- Inspect time series to identify (and remove) outliers
- Run globk to form final solution file for all data (".org"-file) *with estimating velocities*
  - `apr_site all 10 10 10 1 1 1`

  or
  - `apr_neu all 10 10 10 1 1 1`