TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

Introduction to VieVS 2.2

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VieVS User Workshop
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Vienna, Austria

VieVS
Vienna VLBI Software

What is VieVS?

- VieVS = **Vie**nna **V**LBI **S**oftware
- A new, state of the art, geodetic VLBI data analysis software package
- Written in Matlab
- Since 2008 it is developed at the Department of Geodesy and Geoinformation (Research Group Advanced Geodesy), Vienna University of Technology
- Close cooperation with former colleagues (University of Tasmania, Hacettepe University in Turkey, Shanghai Astronomical Observatory)

- Current reference:

Böhm J., S. Böhm, T. Nilsson, A. Pany, L. Plank, H. Spicakova, K. Teke, H. Schuh (2012).

The New Vienna VLBI Software VieVS. Proceedings of the 2009 IAG Symposium,

Series: International Association of Geodesy Symposia. Vol. 136. Geodesy for Planet Earth. Steve Kenyon, Maria Christina Pacino and Urs Marti (Eds.). ISBN 978-3-642-20337-4. pp. 1007-1011. DOI: 10.1007/978-3-642-20338-1_126 .

Why did we develop VieVS?

- Important that there exist several different types of VLBI analysis software
- Different software packages can validate each other. Helps identifying bugs etc.
- Analysts have a choice of what to use
- VLBI2010 / VGOS put new demands and challenges on the VLBI analysis software
- We want to have a VLBI software which is easy to use:
  - BSc, MSc, and PhD students can easily learn it and use it
  - Should be easy to add new models etc. for special investigations
  - Graphical User Interface (GUI)
  - Should have a clear structure

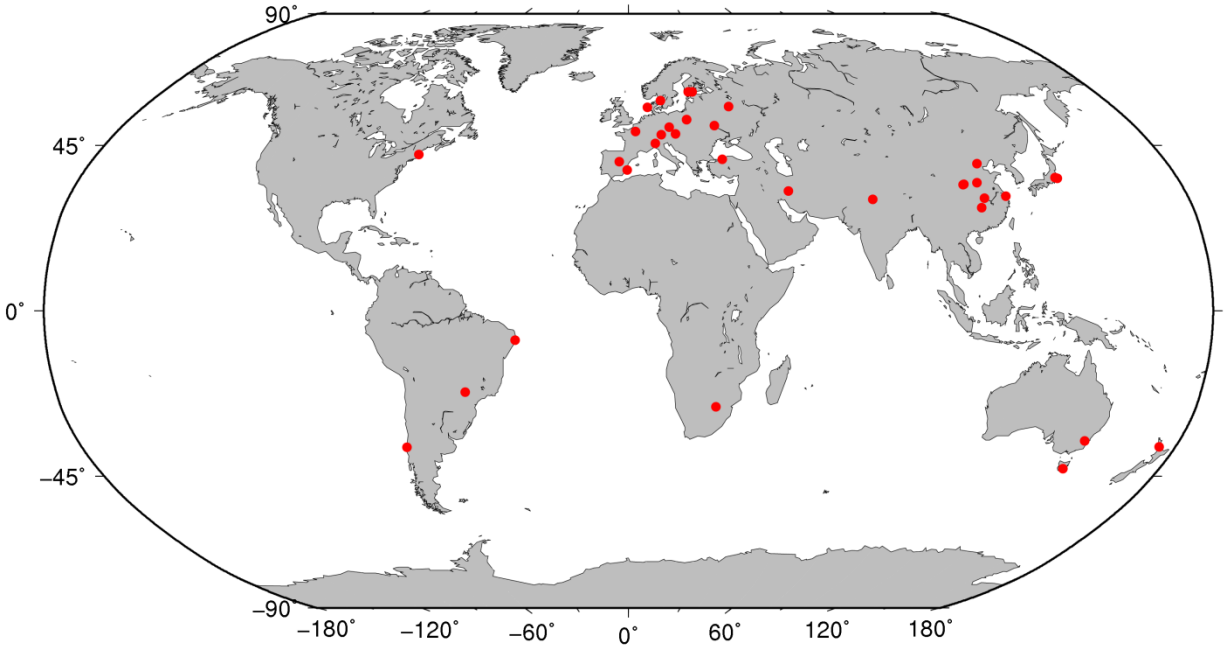
Who did develop VieVS?

Former & current members of the VieVS group at the Vienna University of Technology:

+ contributions from external partners from international universities worldwide

VieVS development

- Development started in 2008
- First version released in the end of 2009 (In the first version many parts were based on OCCAM. Now almost every subroutine is written from scratch)
- New Version 2.2 was released in August 2014
- Freely available to registered users: http://vievs.geo.tuwien.ac.at
- Currently registered users from about 37 institutions worldwide



Why Matlab

- Advantages:
  - Easy to use
  - Easy to change source code
  - Good tools for plotting etc.
  - Matlab available on all major operating systems (Windows, Linux/UNIX, Mac OS)

- Disadvantages:
  - Matlab is an expensive commercial software

    (VieVS is in principle working on GNU Octave, but without GUI and it is much slower; Qt Interface (V. Choliy))
  - Slower than C++ or Fortran. Not a major problem.

System Requirements

- MATLAB 7.6 (R2008a) or later.
- About 7 GB of disk space, including all data files
  (NGS files 1979-now: 6.7 GB, source code: <10 MB)
- Should work with any operating system able to run the chosen MATLAB version (tested on Windows and Linux)
- Possible to run on older MATLAB versions or the free counterpart GNU-Octave if the Graphical User Interface is not used

Policy

- VieVS is freely available to registered users:
  - Easier to get feedback
  - Easy to spread information about bugs, new updates, etc.
  - Nice to know how many and who are using the software

- For information, see VieVS homepage http://vievs.geo.tuwien.ac.at and the new VieVS-Wiki webpage http://vievswiki.geo.tuwien.ac.at

- We are open for cooperation:
  - Modules etc. can be written at other institutions

Downloading and Installing VieVS

- VieVS can be downloaded using ssh/sftp from the server:

  vievs.hg.tuwien.ac.at

- or from the VieVS website:

  http://vievs.geo.tuwien.ac.at/

  --> Get VieVS

- Log in as user *users* and download the **VieVS directory.**

Downloading VieVS using rsync

- On Unix/Linux systems, VieVS can easily be downloaded using the rsync command:

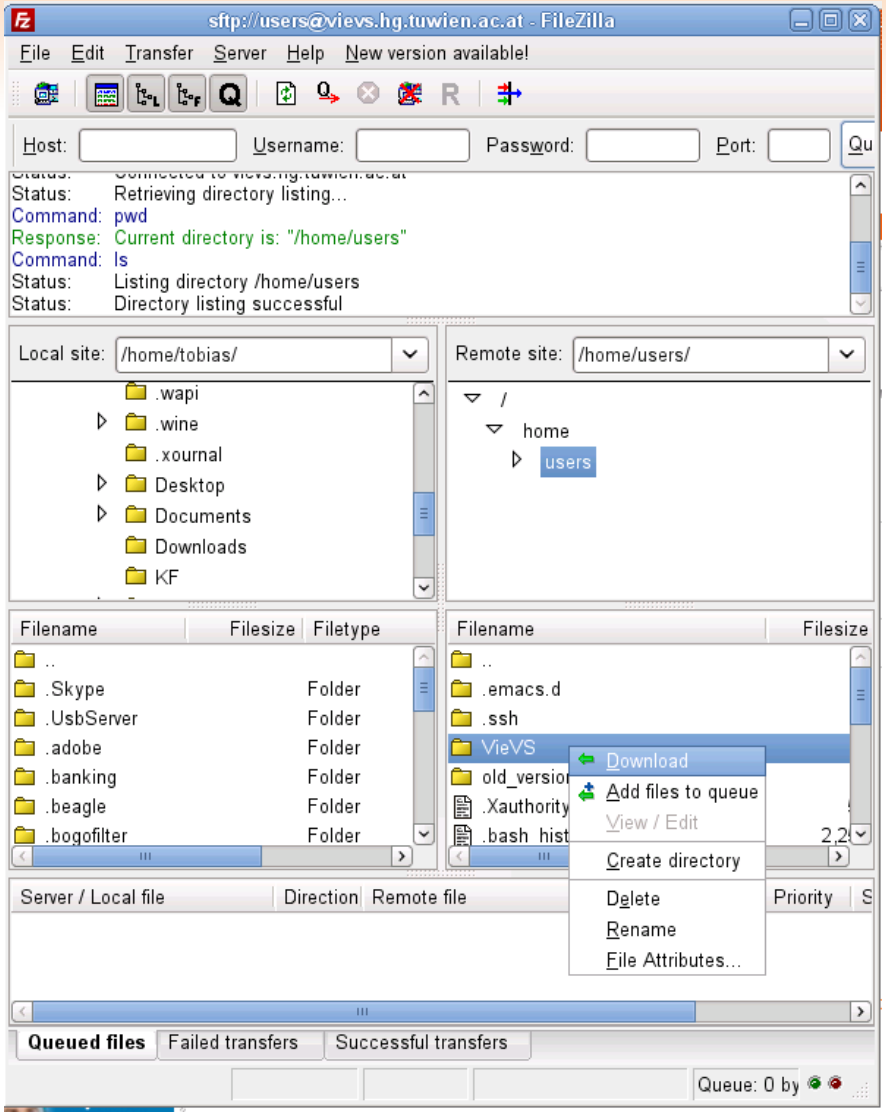
  rsync –aL users@vievs.hg.tuwien.ac.at:VieVS

- The same command can also be used to update your VieVS installation

- To skip the NGS files (e.g. slow connections):

  rsync -aL --exclude 'DATA/NGS/*‘ users@vievs.hg.tuwien.ac.at:VieVS

Downloading VieVS using an sfpt/scp client



- Log in to *vievs.hg.tuwien.ac.at* with your favourite sftp client (e.g.Filezilla).
- Download the **VieVS** directory

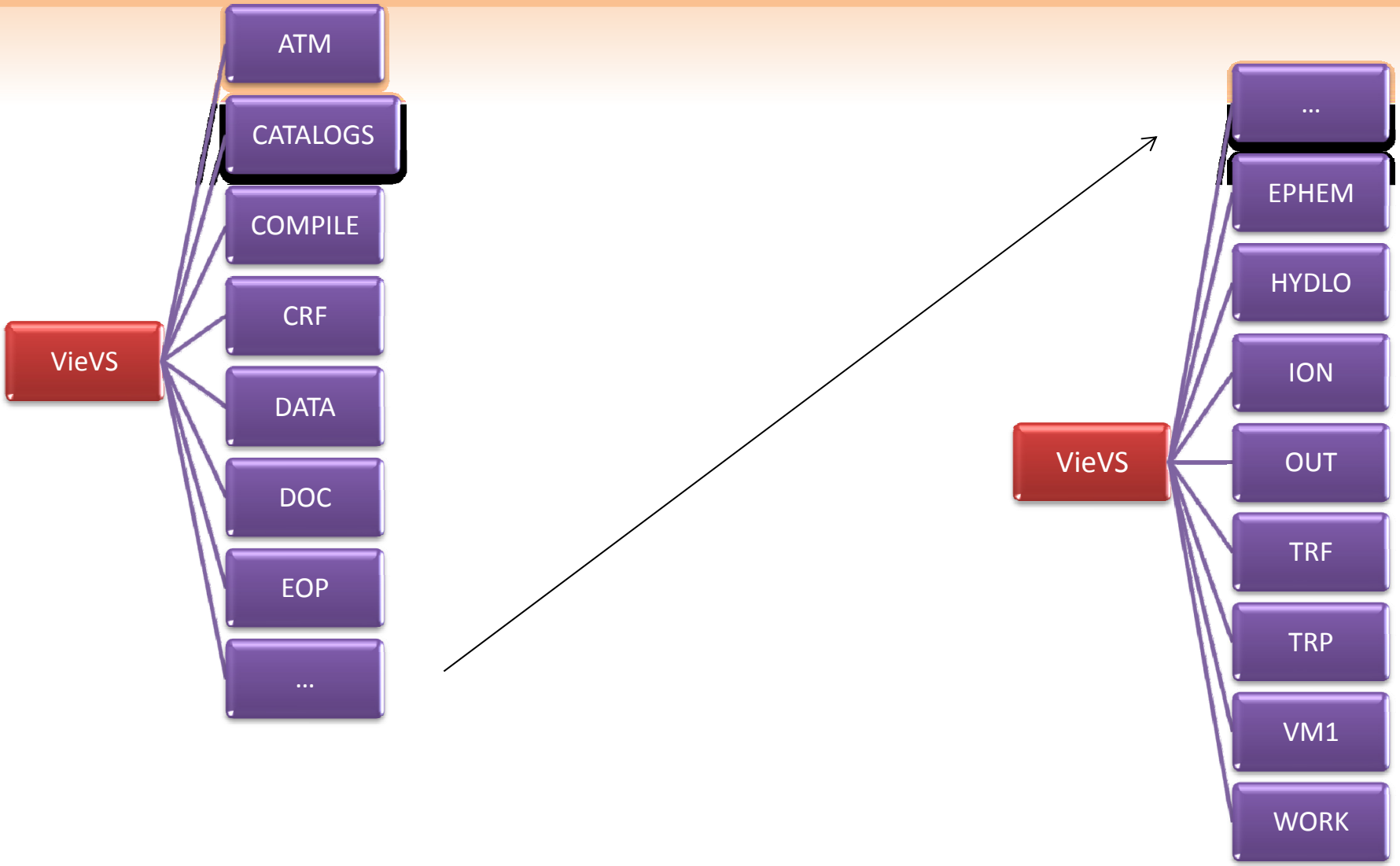
Updating VieVS

- Regularly updates (to be able to analyse the latest sessions):
  - **VieVS/DATA/NGS/**
  - **VieVS/ATM/ , VieVS/VM1/**
  - **VieVS/EOP/**
  - **(VieVS/HYDLO/** - not updated automatically on the server**)**

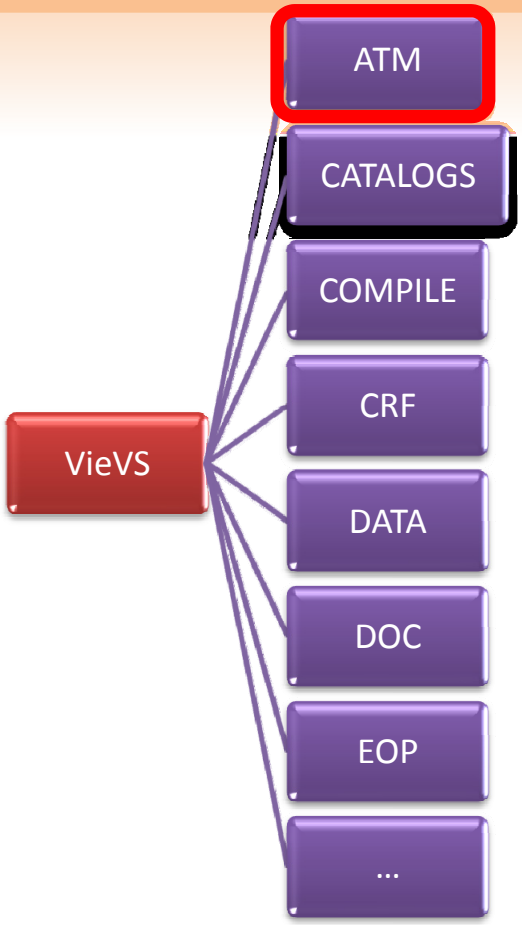
- For a session with a new station or source
  - check for updated **superstation.mat** file in **VieVS/TRF** and/or updated **supersource.mat** file in **VieVS/CRF**

- When a new version is released:
  - **VieVS/COMPILE/**
  - **VieVS/OUT/**
  - **VieVS/WORK/**
  - Possible other directories...

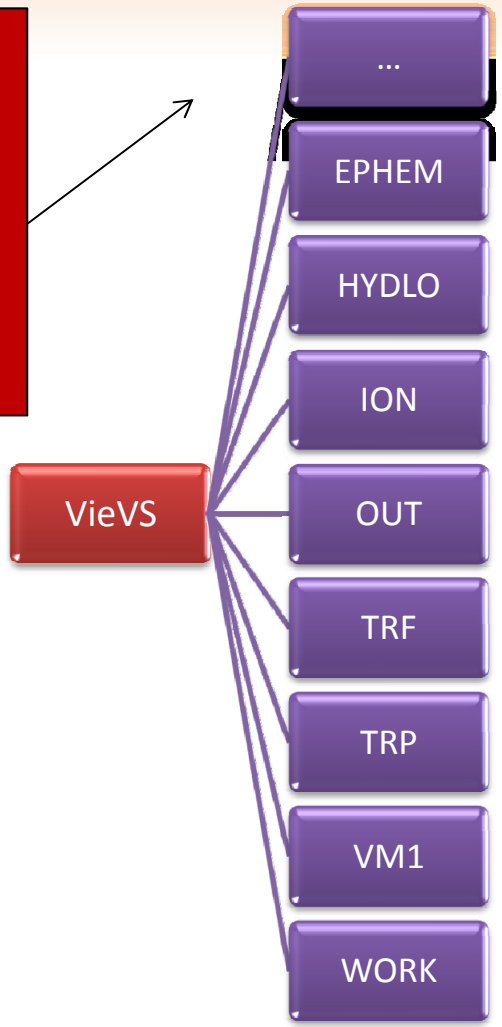
VieVS directories



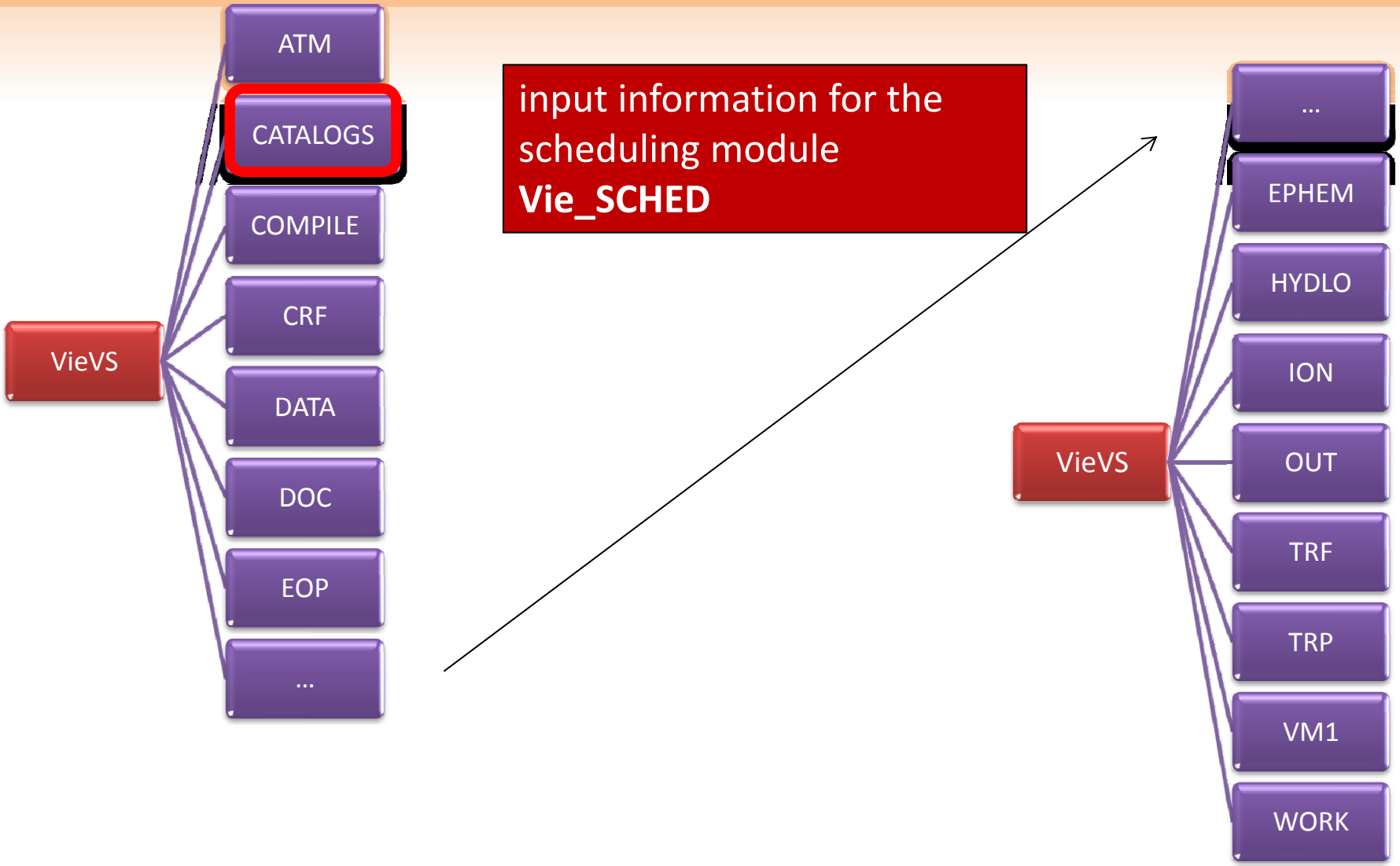
VieVS directories



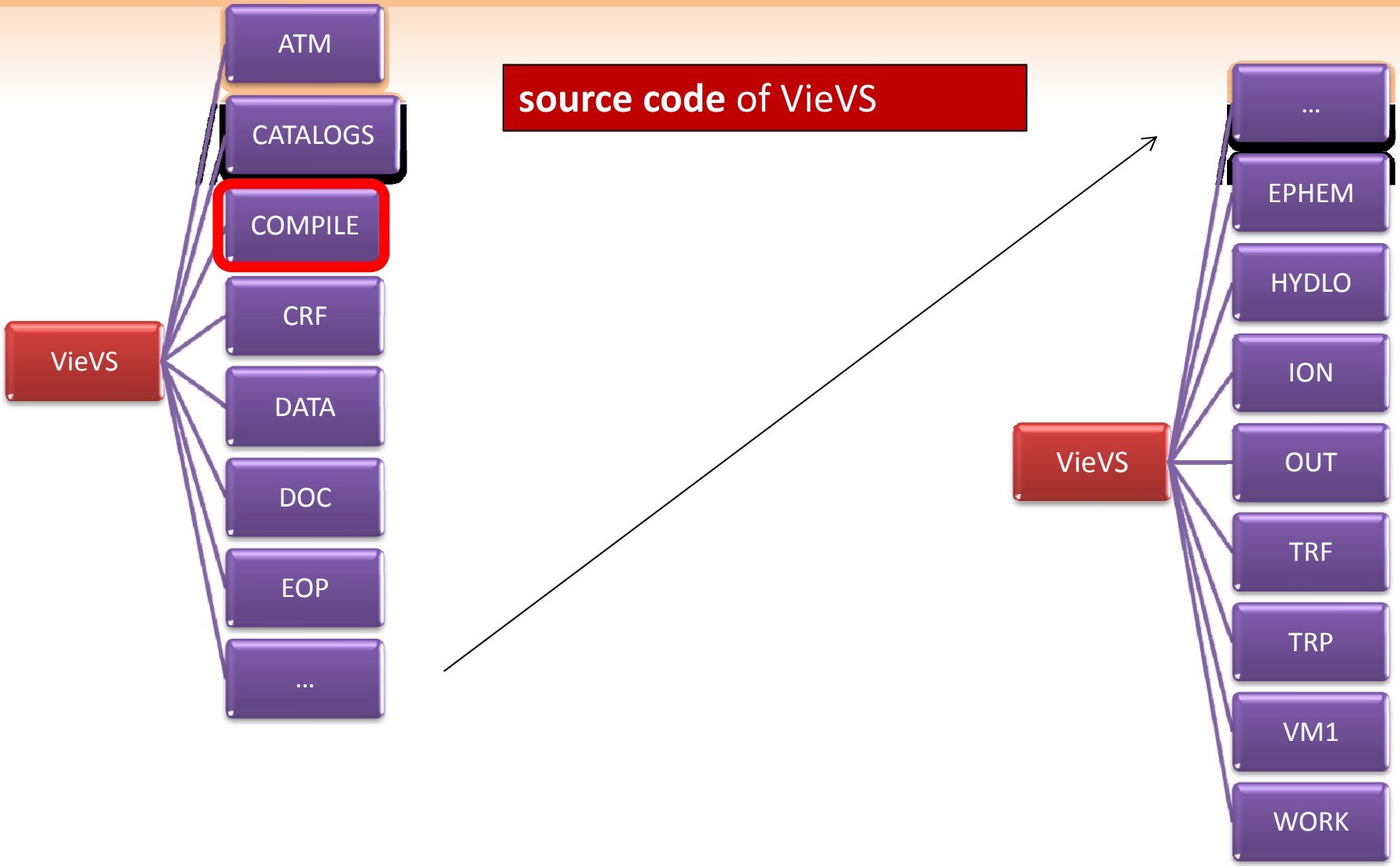
time-series of **atmospheric non-tidal loading corrections** for station coordinates
APL_VIENNA/
GSFC/



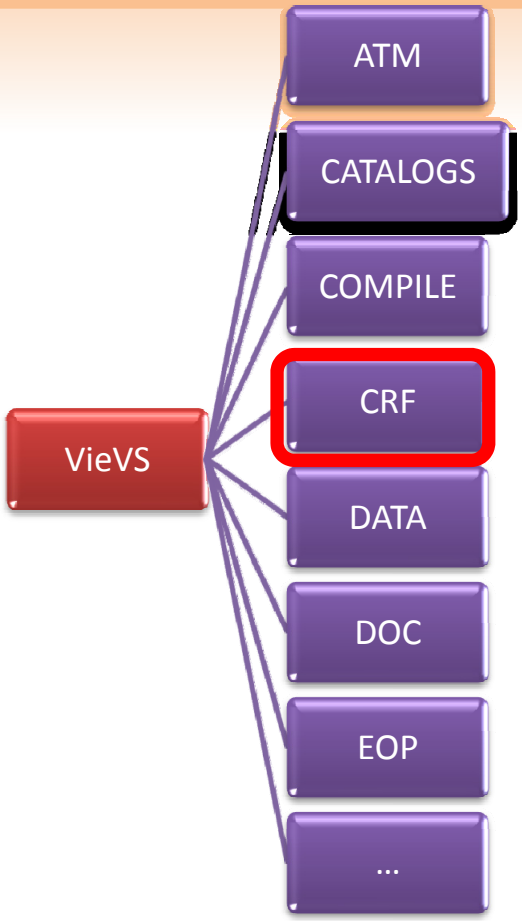
VieVS directories



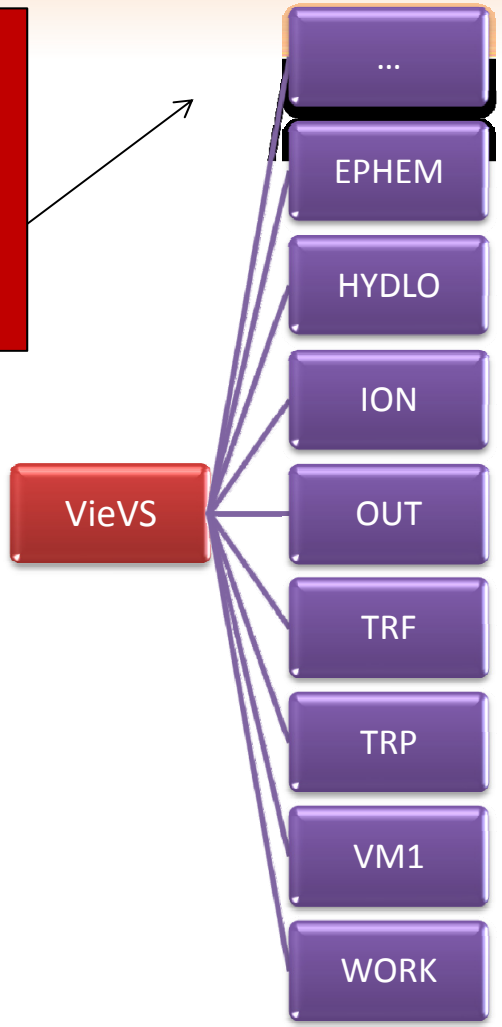
VieVS directories



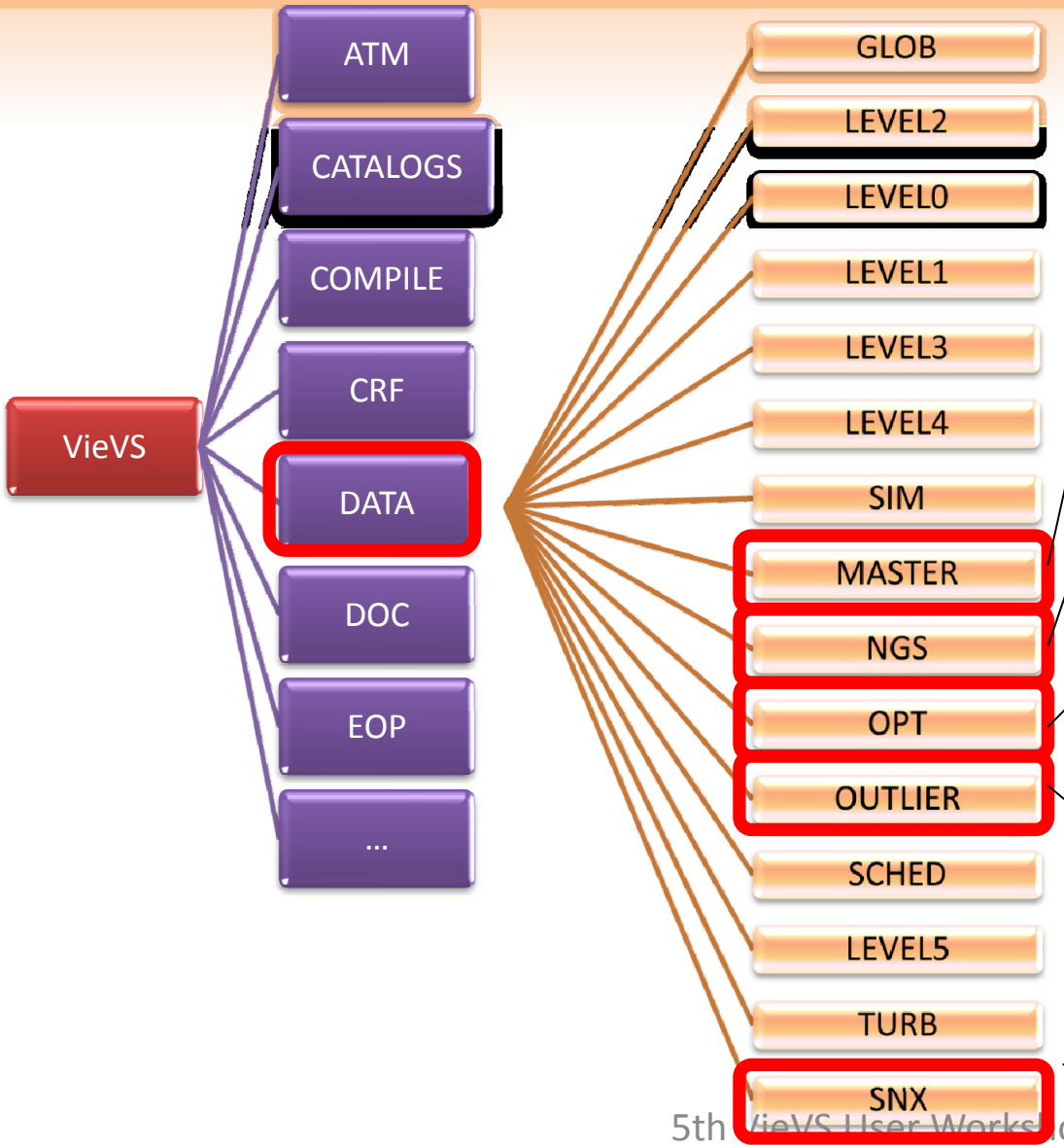
VieVS directories



contains the file **supersource.mat** (position of sources in several catalogues) and functions to create this file



VieVS directories



master files contain a list of observed sessions

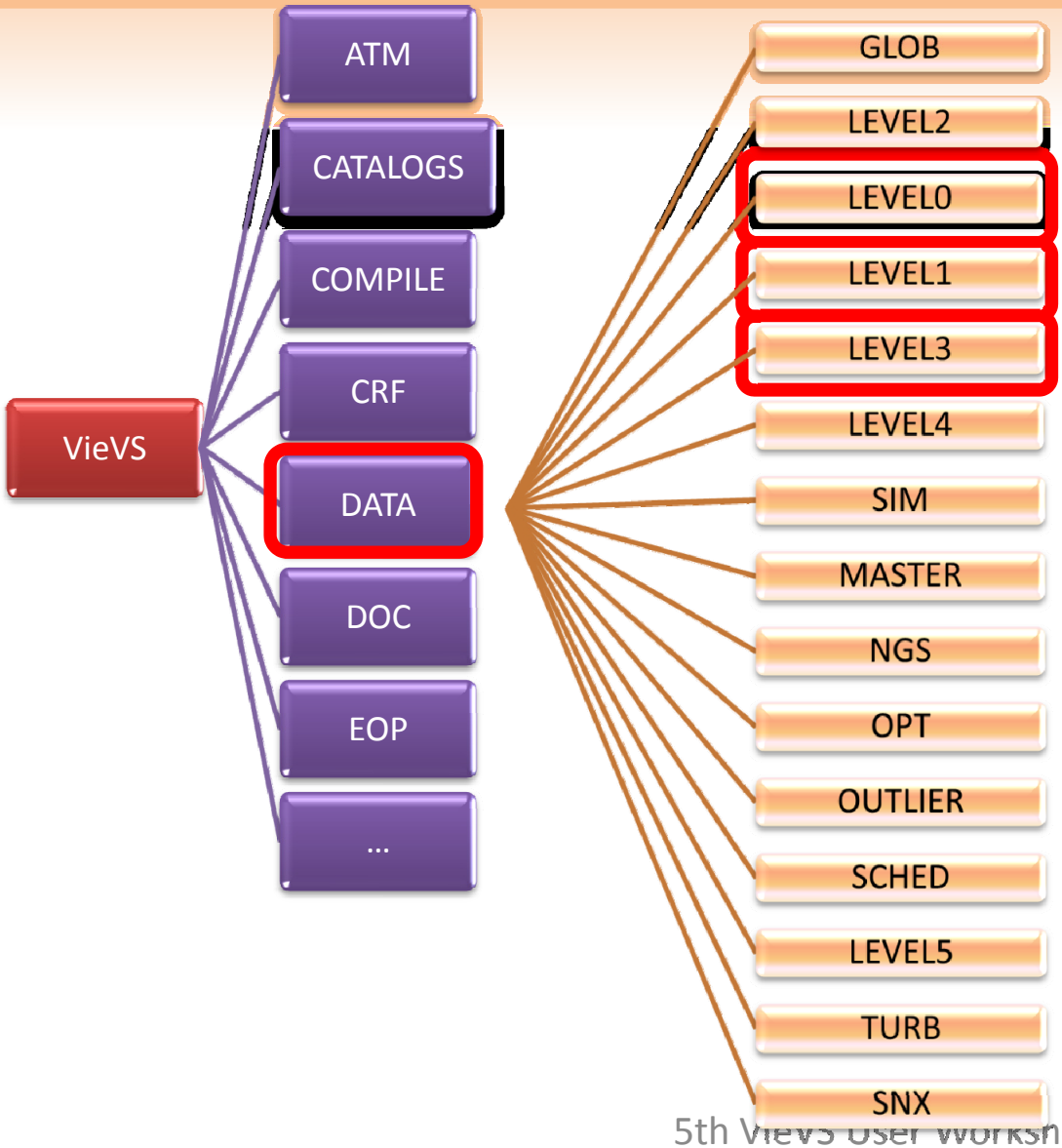
NGS files contain the measured time delay

OPT files include specific options for analysis of a session

files with outliers for each session created with VieVS

results as SINEX files

VieVS directories

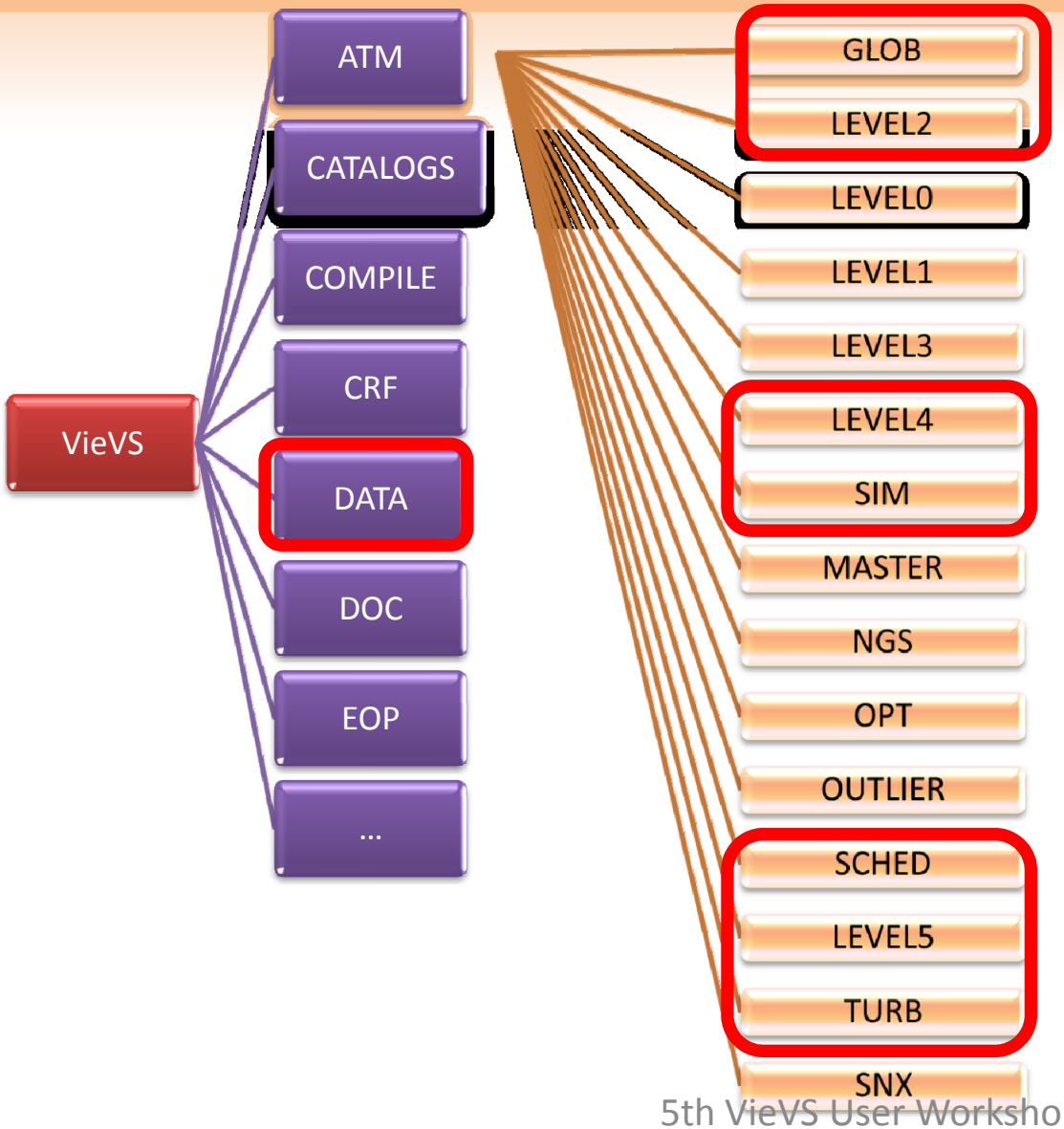


files created with Vie_INIT

files created with Vie_MOD

results stored with Vie_LSM or Vie_LSM_scan

VieVS directories

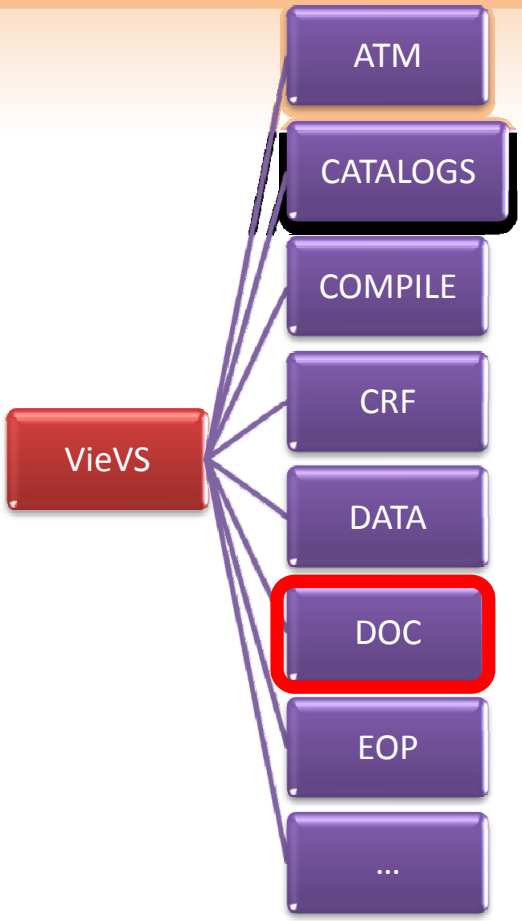


files for Vie_GLOB

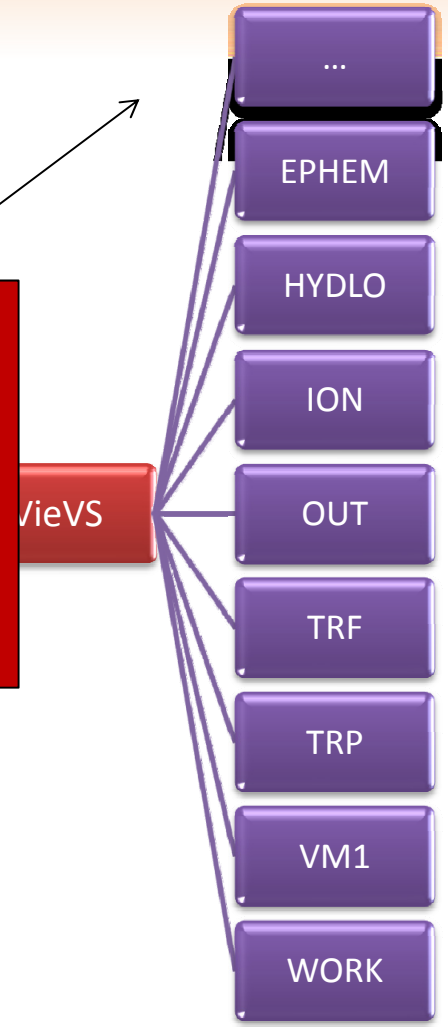
files for Vie_SIM

files for Vie_SCHED

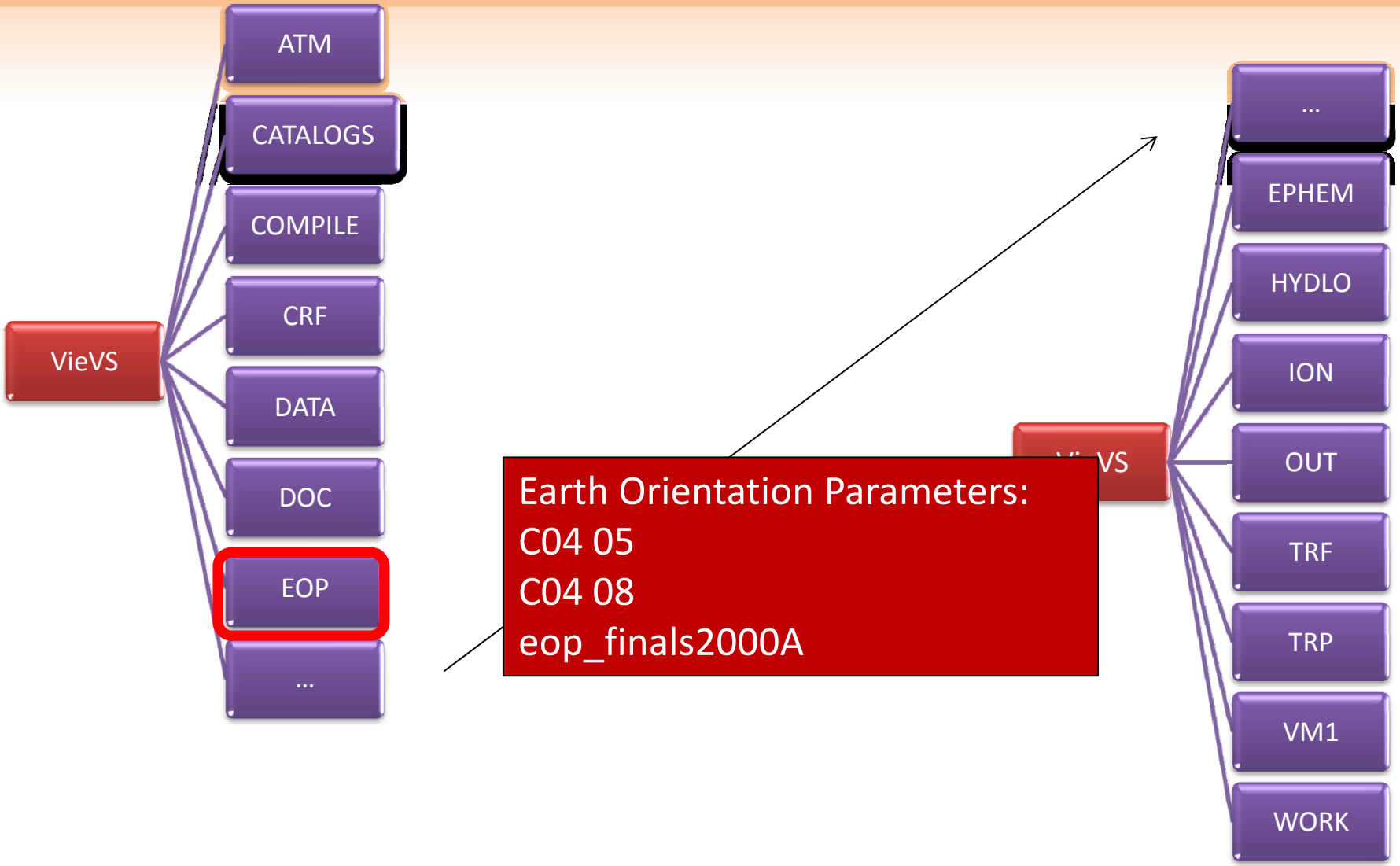
VieVS directories



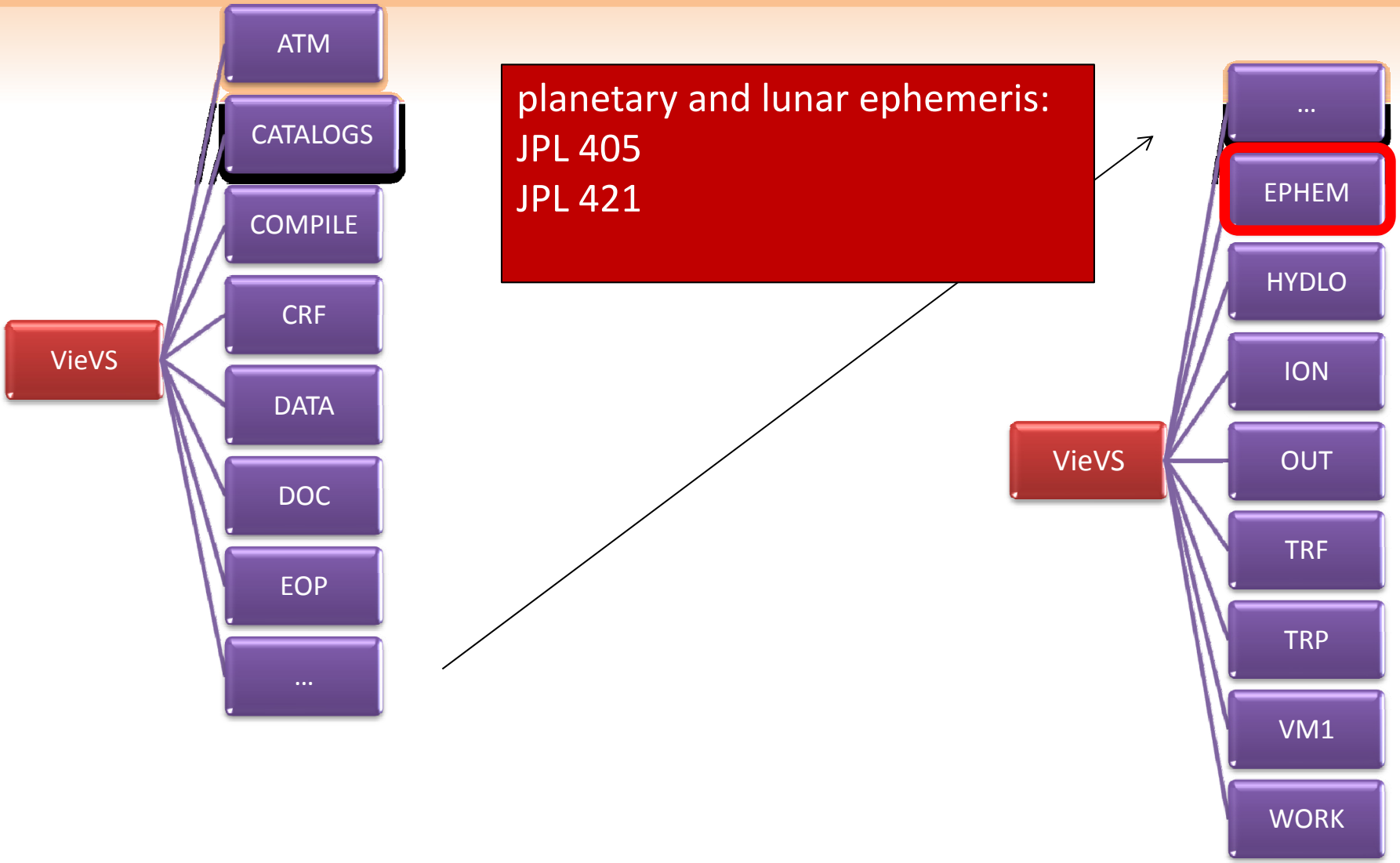
documentation and useful publications,
user manual can be also downloaded at the VieVS homepage:
http://vievs.geo.tuwien.ac.at



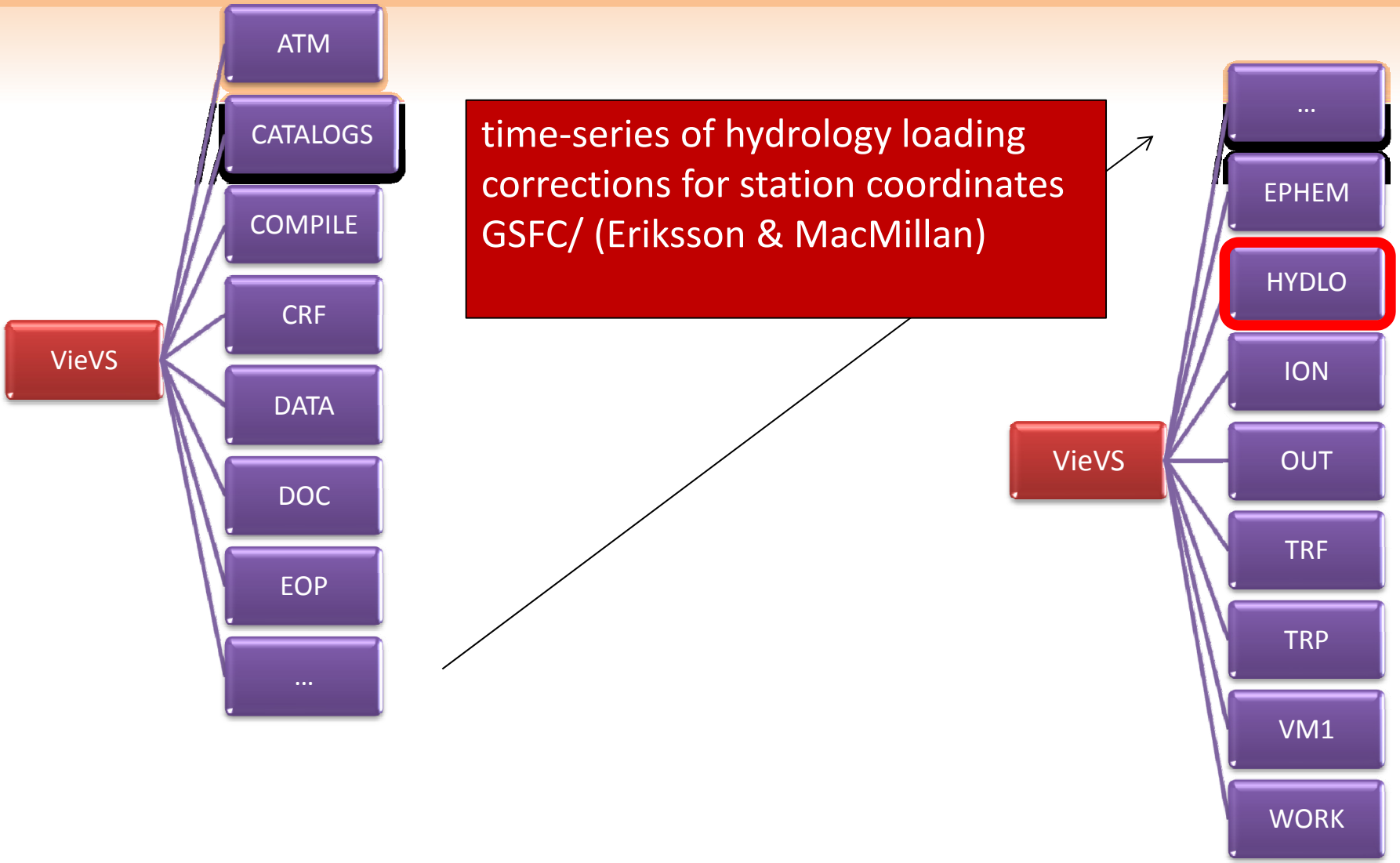
VieVS directories



VieVS directories



VieVS directories



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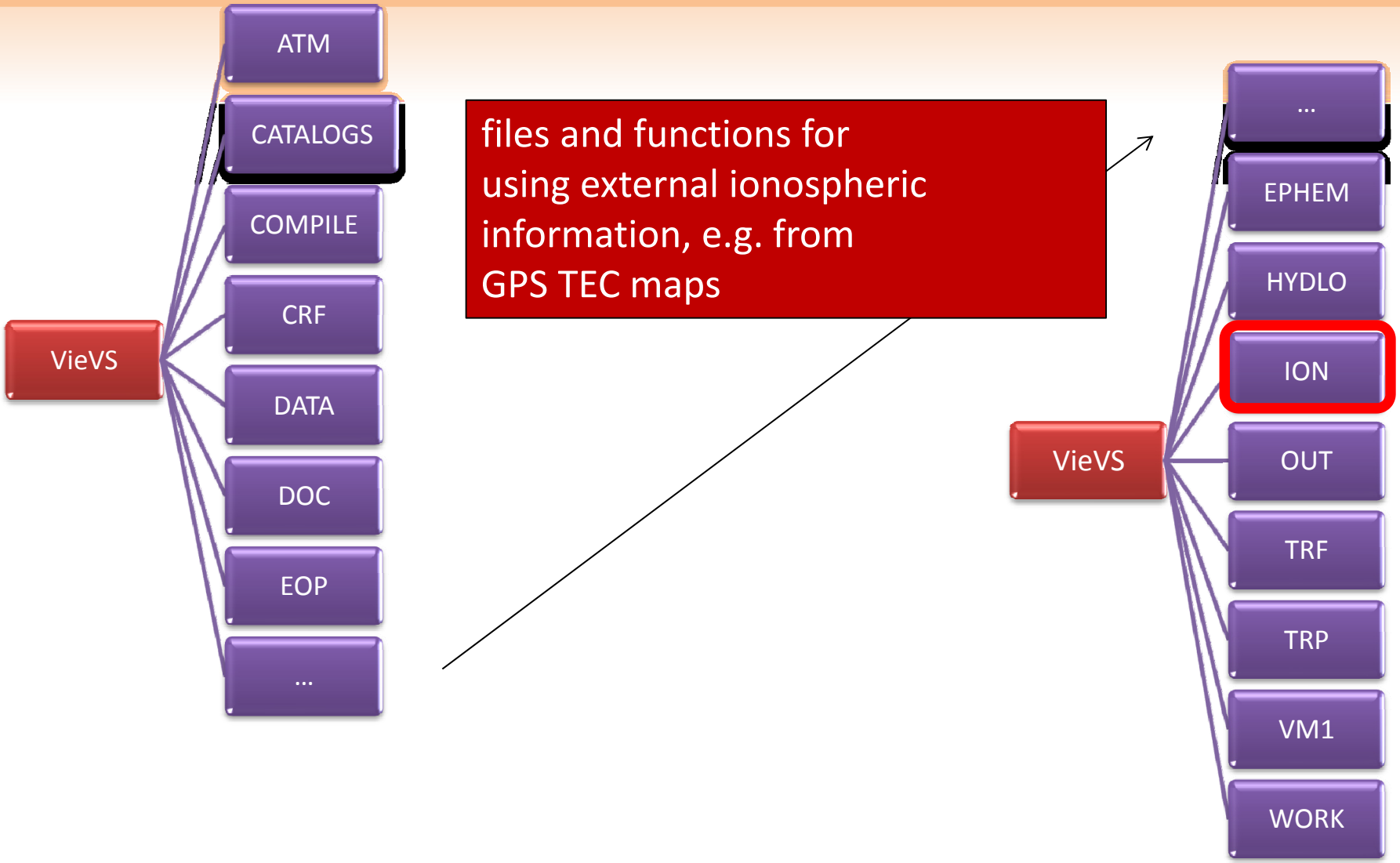

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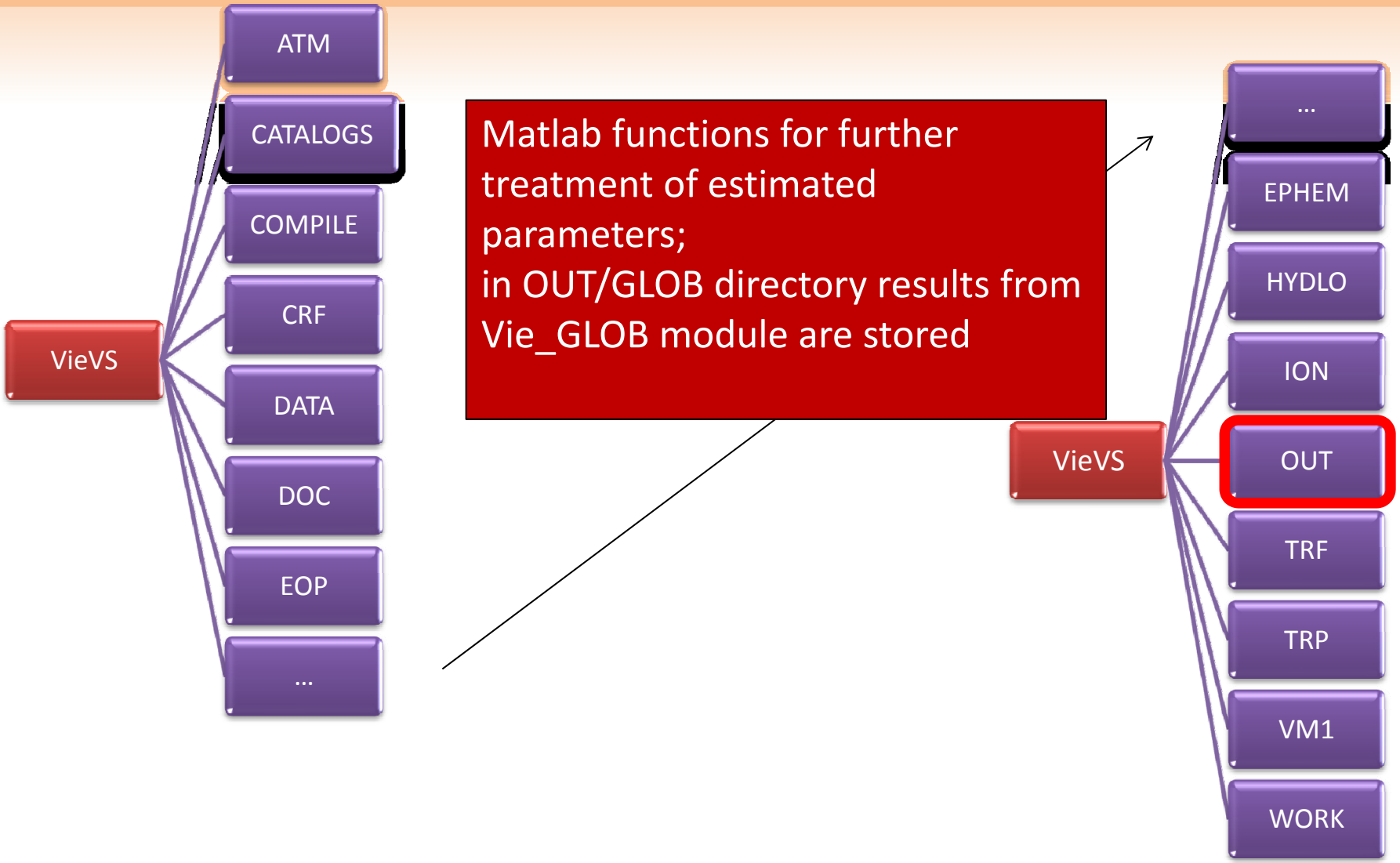

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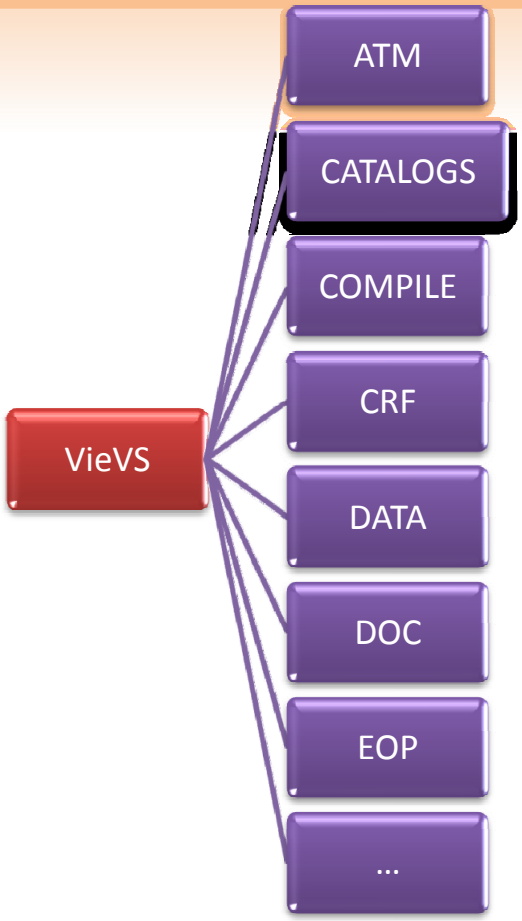
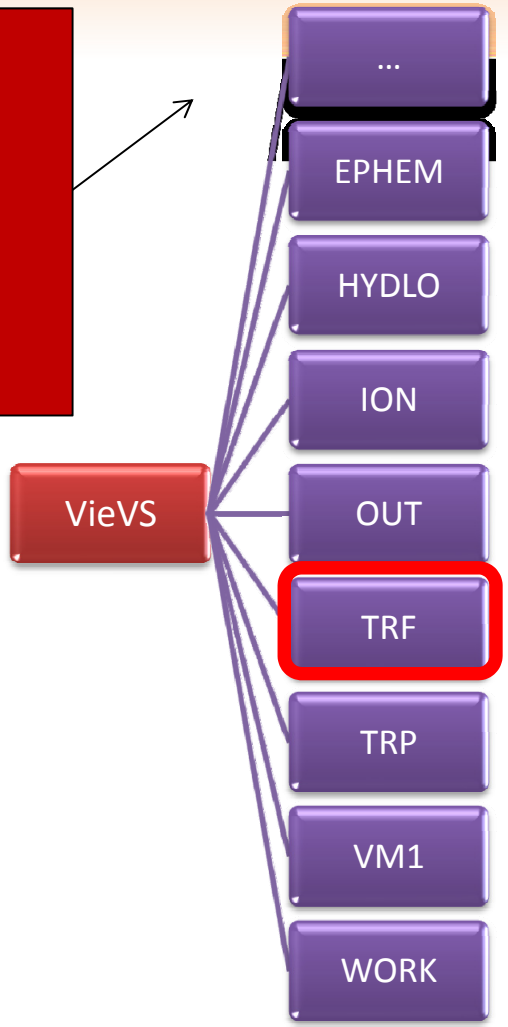
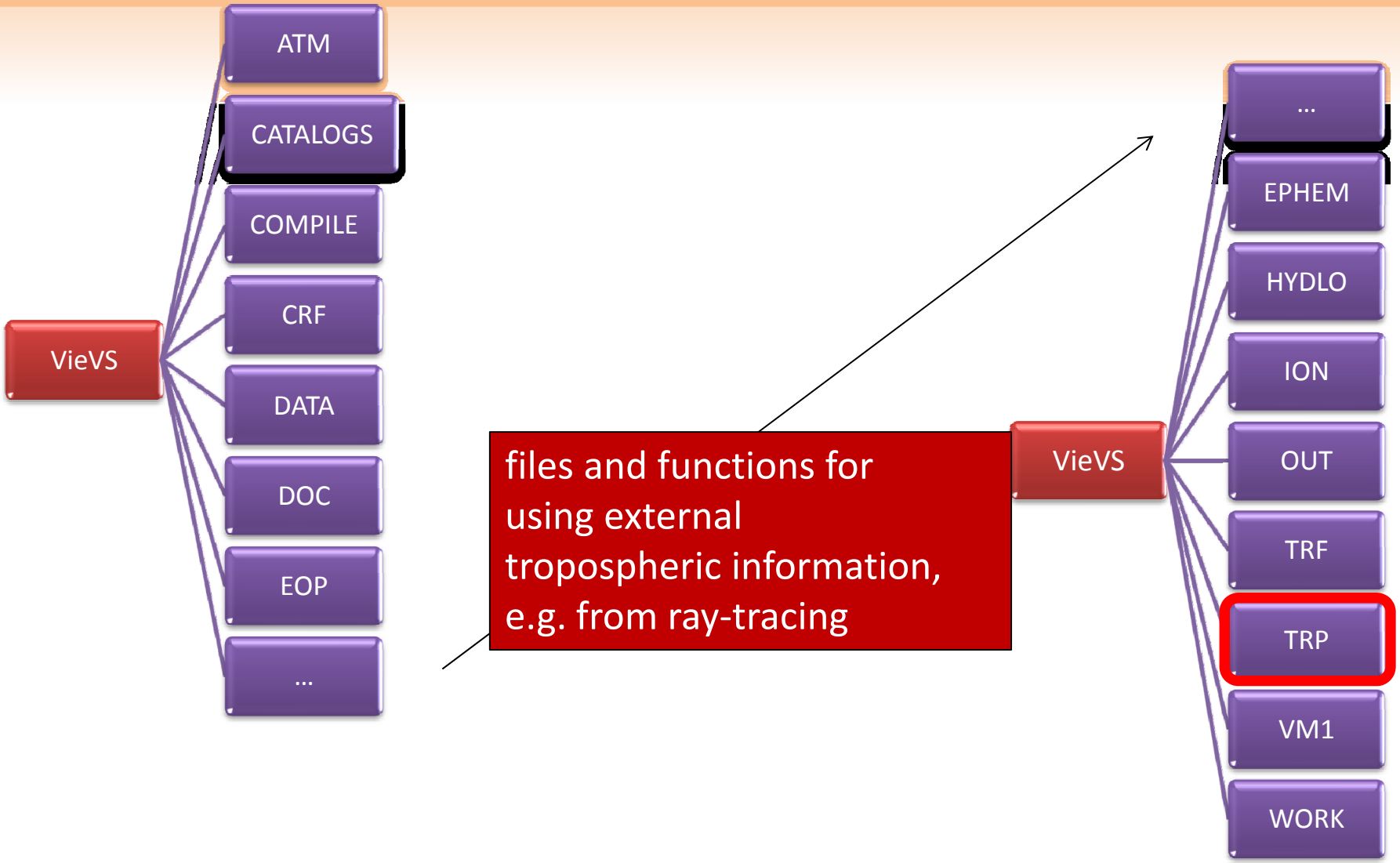


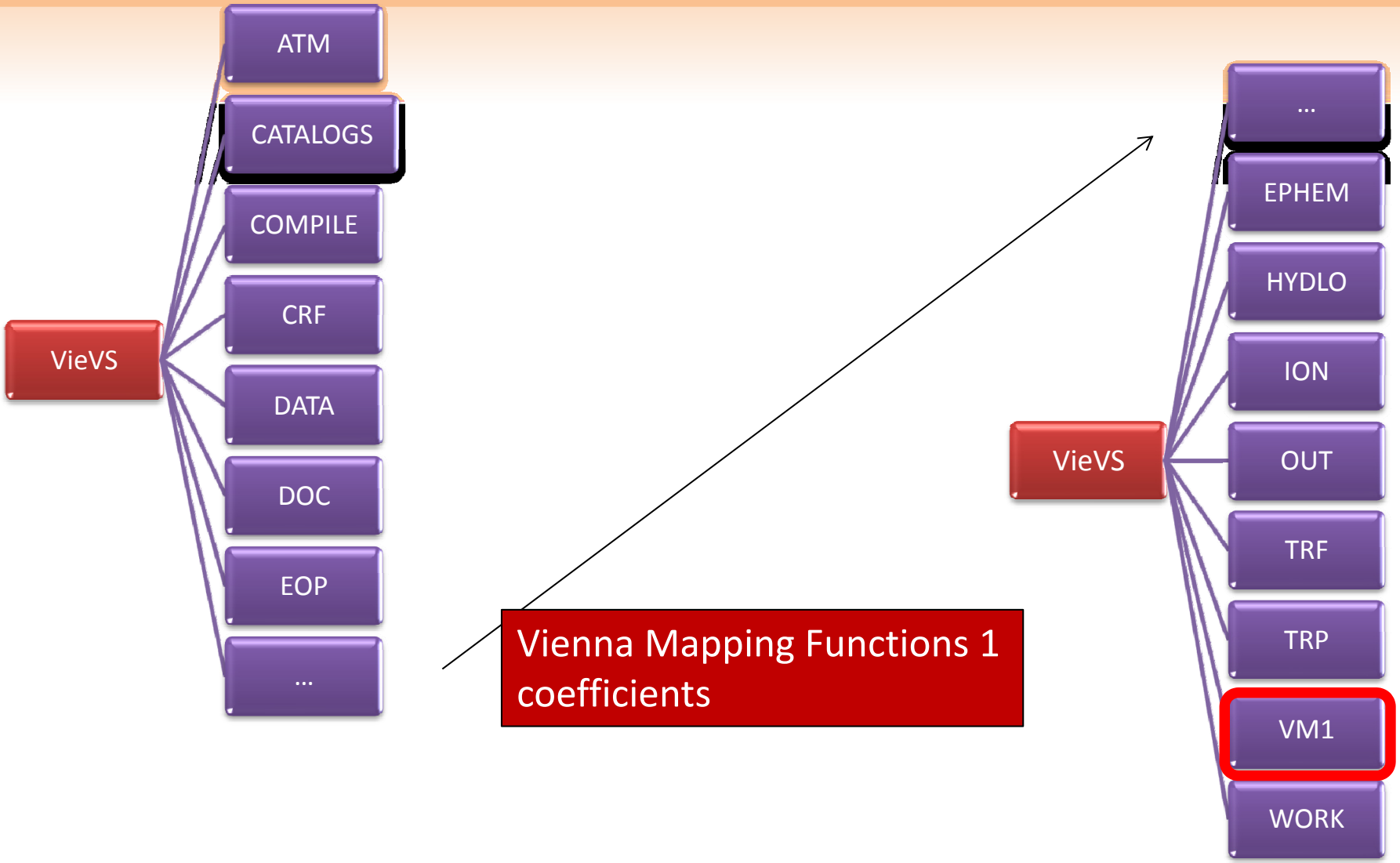
contains
- the file **superstation.mat** (position of stations in several catalogues and time-independent parameters)
- functions to create this file



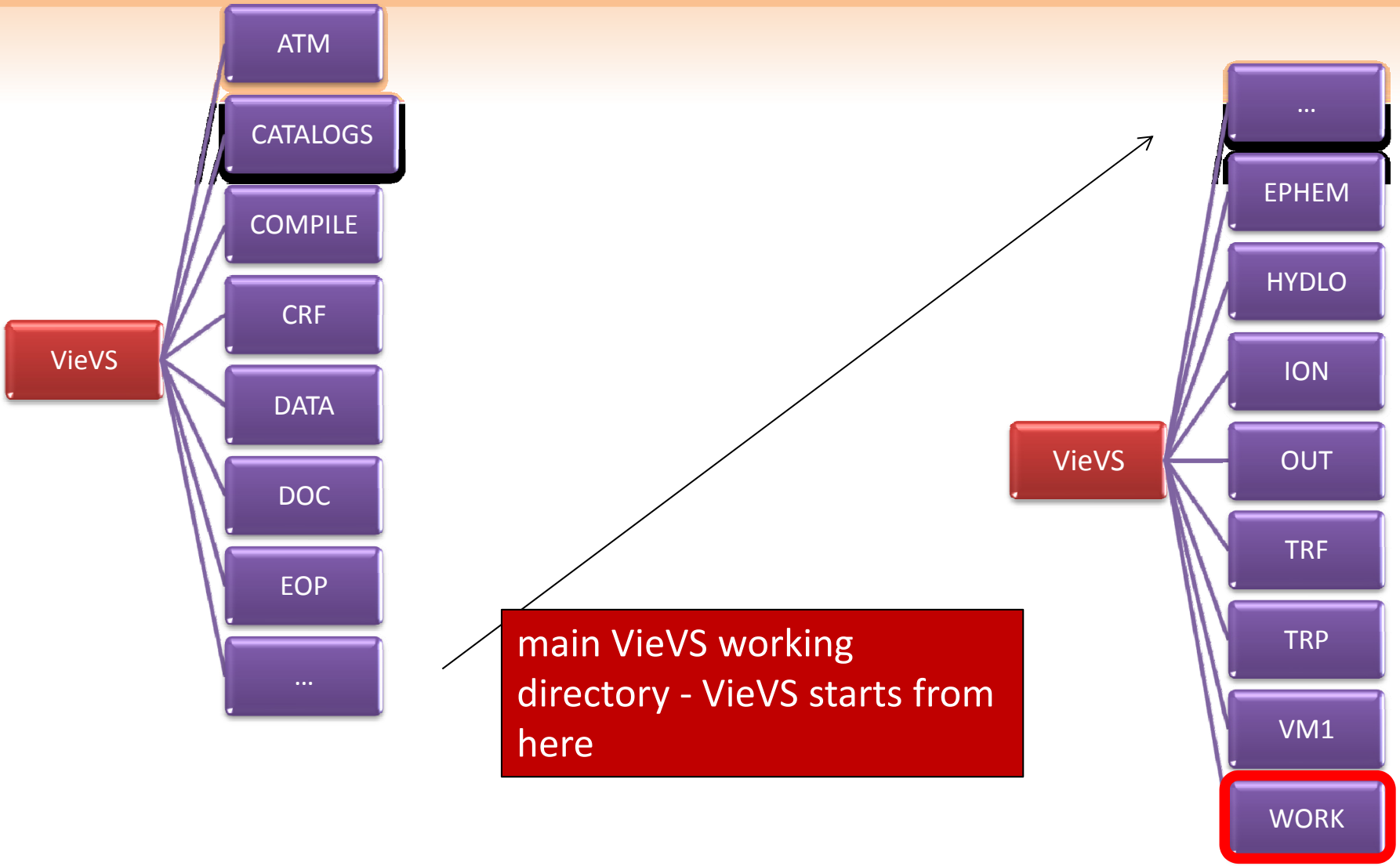
VieVS directories



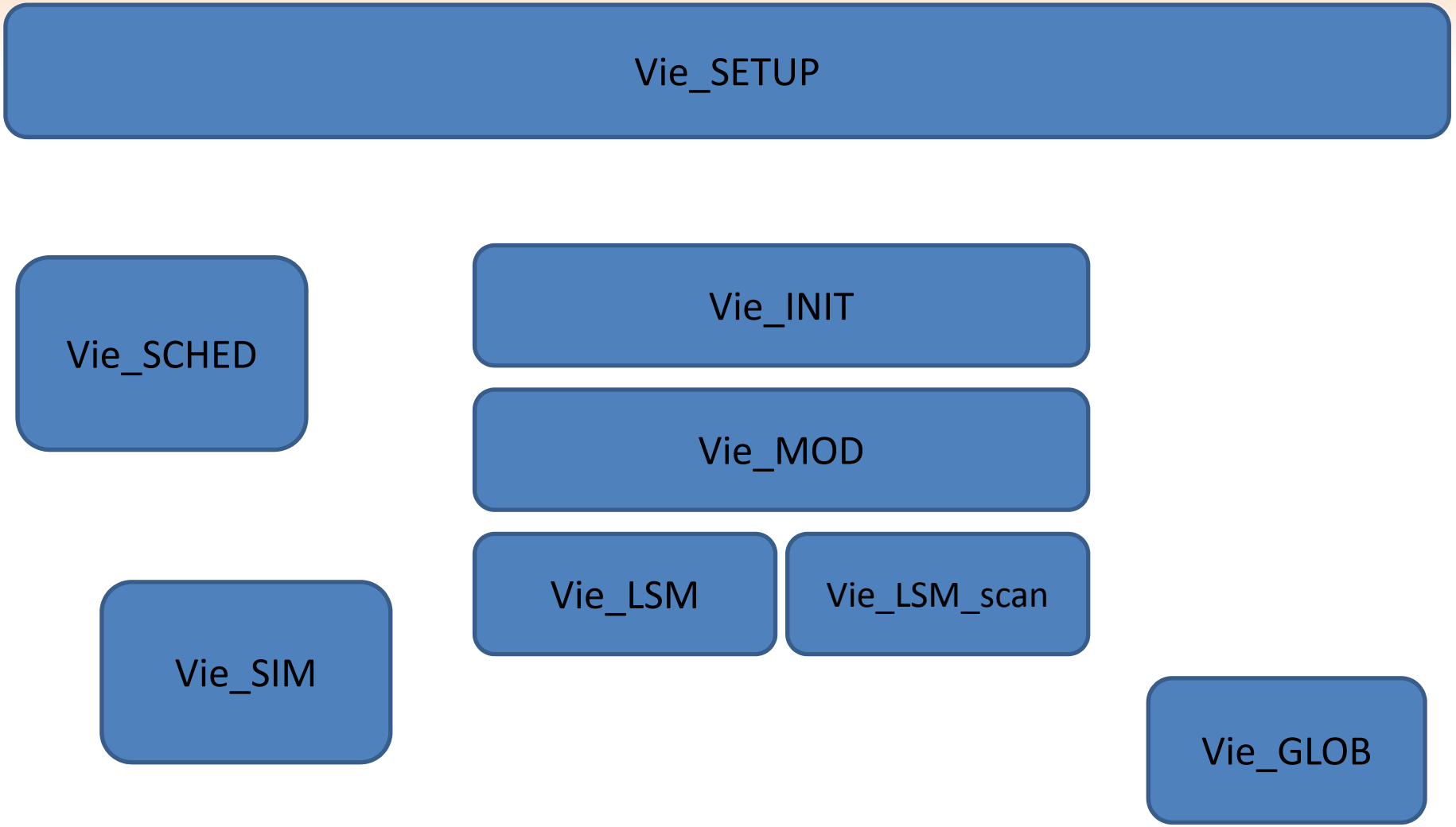
VieVS directories



VieVS directories



Modules of VieVS



Modules of VieVS

Vie_SETUP

Graphical User Interface for all modules;

allows to choose the options and parameterization

Vie_SCHED

Vie_MOD

Vie_LSM

Vie_LSM_scan

Vie_SIM

Vie_GLOB

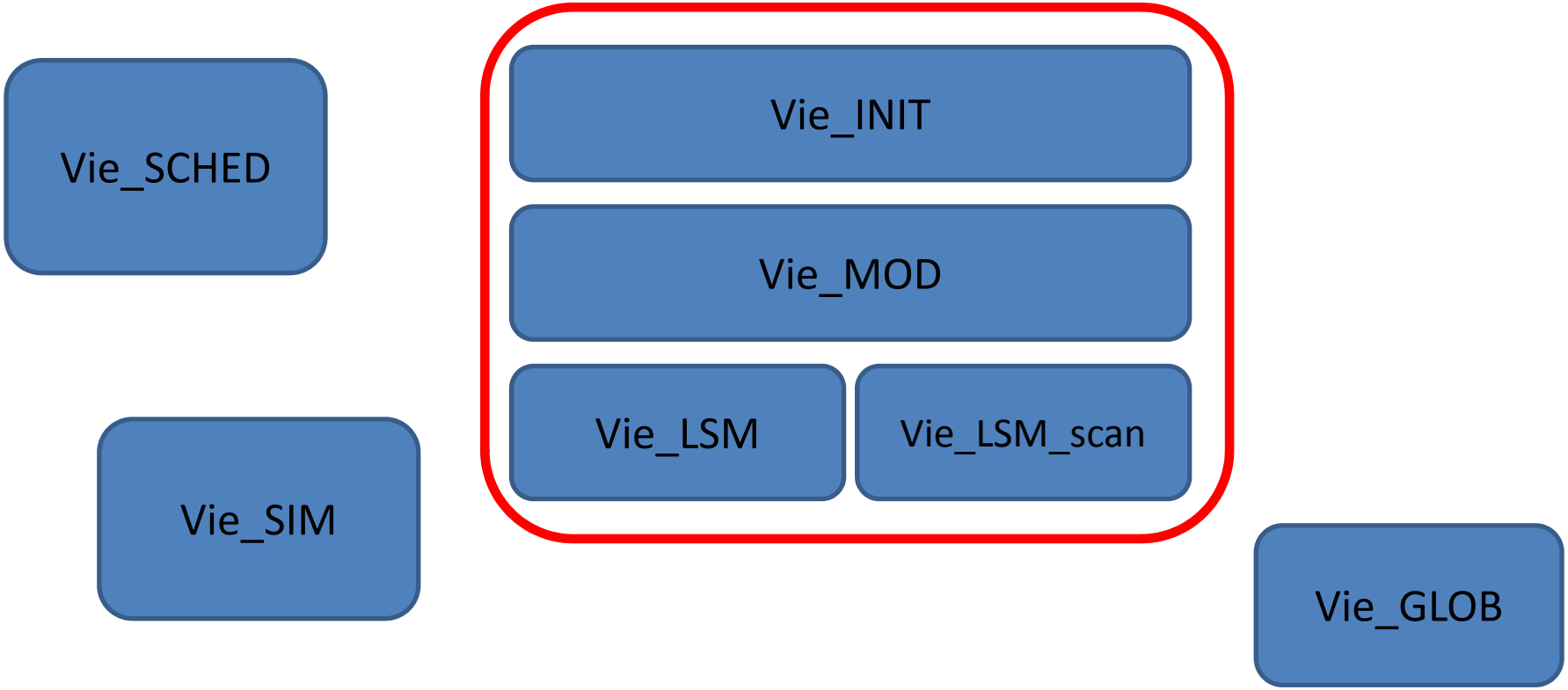
The 3 core modules for an analysis of a session

Vie_INIT- reads in data

Vie_MOD - calculates the theoretical time delay and builds up the partial derivatives

Vie_LSM – estimates the unknown parameters with Least Square Method

Vie_LSM_scan – similar to Vie_LSM but uses a scan-wise update of the A matrix (useful for large sessions)



Modules of VieVS

Vie_SETUP

Scheduling module

Vie_SCHED

Vie_INIT

Vie_MOD

Vie_LSM

Vie_LSM_scan

Vie_SIM

Simulation tool creating artificial observations

Global solution

Vie_GLOB

Files used and created by different parts of VieVS

- VIE_SETUP (= GUI)
- Reads: superstation.mat and supersource.mat

- Creates:
  - **WORK/process_list.mat:** list of sessions to be processed
  - **WORK/runp.mat:** general information about the processing, e.g. which parts of VieVS will be run
  - Parameter files in the **DATA/LEVEL0/ directory**

    Contains the chosen options for the analysis. One for each session in the process list. Name: **SESSIONNAME_parameter.mat,** e.g. **08AUG12XA_N004_parameter.mat**

Files used and created by different parts of VieVS

- VIE_INIT
  - Reads:
    - Parameter file from **DATA/LEVEL0/** directory **(e.g. 08AUG12XA_N004_parameter.mat)**
    - Outlier file
    - OPT file

  - Creates structure arrays and saves them in **DATA/LEVEL0/:**
    - antenna: list of stations in the session (saved as e.g. **08AUG12XA_N004_antenna.mat)**
    - sources: list of sources observed in the session (saved as e.g.
    - **08AUG12XA_N004_sources.mat)**
    - scan: list of scan (saved as e.g. **08AUG12XA_N004_scan.mat)**

Files used and created by different parts of VieVS

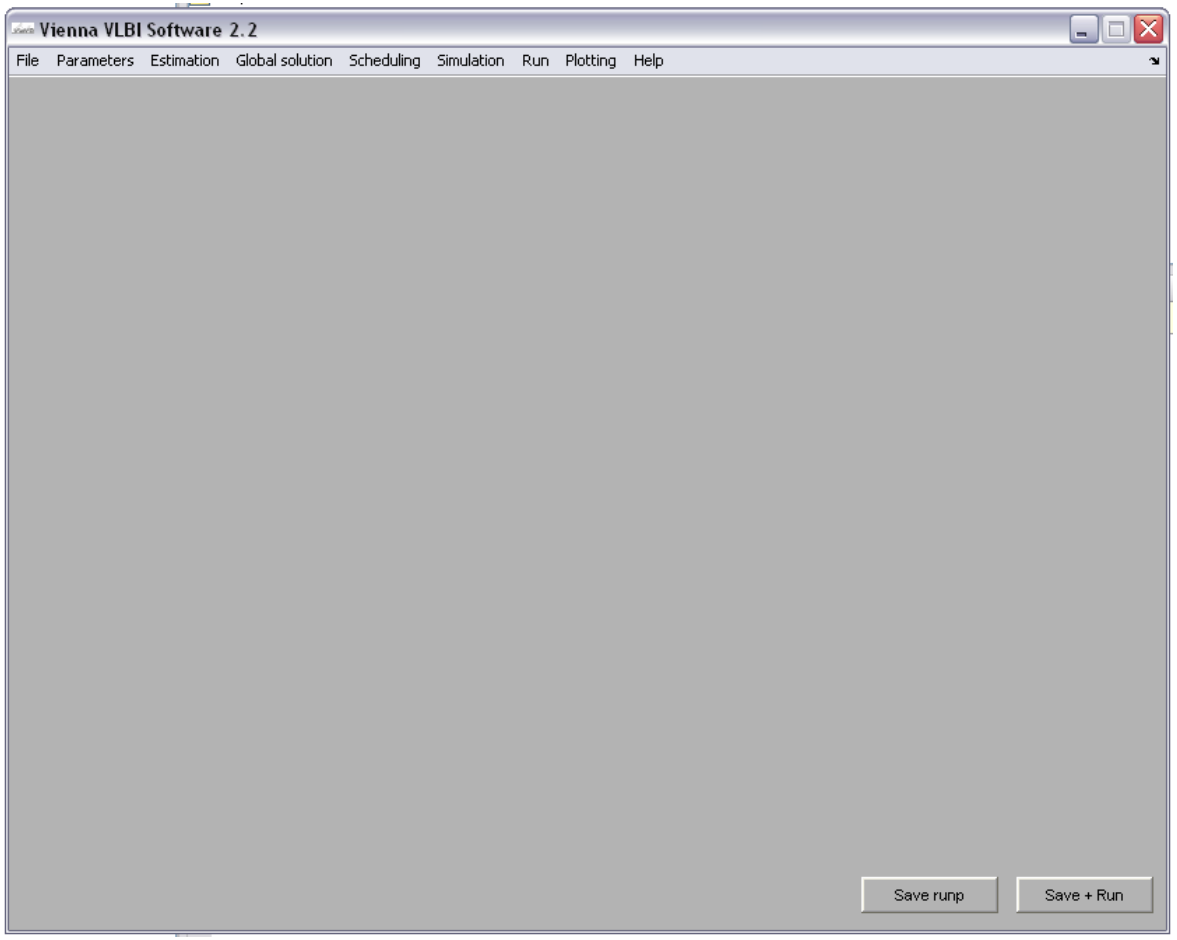
- VIE_MOD
  - Reads:
    - structure arrays (parameter, antenna, sources, and scan) from **DATA/LEVEL0/**
  - Saves the structure arrays with added information in **DATA/LEVEL1/:**
    - the names are identical as in LEVEL0

Files used and created by different parts of VieVS

- VIE_LSM
  - Reads:
    - The structure arrays from **DATA/LEVEL1/** directory
    - OPT file
  - Creates:
    - **DATA/LEVEL3/:**
    - x_ (e.g. **x_08AUG12XA_N004.mat)** contains the estimated parameters
    - opt_ (e.g. **opt_08AUG12XA_N004.mat)** contains the lsm options
    - apta_, atpl_: normal equation matrices
    - res_ (e.g. **res_08AUG12XA_N004.mat)** post-fit residuals
    - **DATA/LEVEL2/: Data for global solution (datum free NEQs)**
    - **DATA/OUTLIER/: Detected outliers**

How to start VieVS

- Start MATLAB
- Change directory to **VieVS/WORK/**
- Start VieVS with the command: *vievs*
- The VieVS GUI will now appear



Running VieVS in batch mode

- Run: ***vievs('batch')***
- The processing starts directly, GUI is not displayed
- Requires that all option files (process list, parameter files, runp) have already been created (e.g. from a previous run)

Run an older version of VieVS

- To run an older VieVS version, e.g. 1d: ***vievs('1d')*** or 2.1: ***vievs(' 21')***
- To run version 2.2 in batch mode: ***vievs('22','batch')***
- Requires that the specific version of VieVS is installed.
- Never mix different versions!

Thank you for your attention!