Australian National University

Automatic Wave Processing for Rare Seismic Phases

EMSC4033: Computational Geosciences

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Introduction

Problem: Rare seismic phases underly challenging observation conditions.

Solution: Interactive application to simplify wave processing of these phases.

- Guides user through all steps of data acquisition and processing.
- Prevents processing errors

Target Group: Students; researchers with limited time; basic knowledge of seismology is required.

Background and Innovation

What exists already:

- Obspy
- Wilber3 (SAGE)
- Computer programs for processing and analysis of seismic data (expensive)
- Computer programs to produce synthetic waveforms
- Specialized processing algorithms

What's new:

- Station-based approach
- Simplicity of the program
- Interaction
- Focus on rare seismic phases

Goals

(1) Provide a list of suitable earthquake events for seismic station.

(2) Process the waveforms using the parameters recommended in literature or specified by the user.

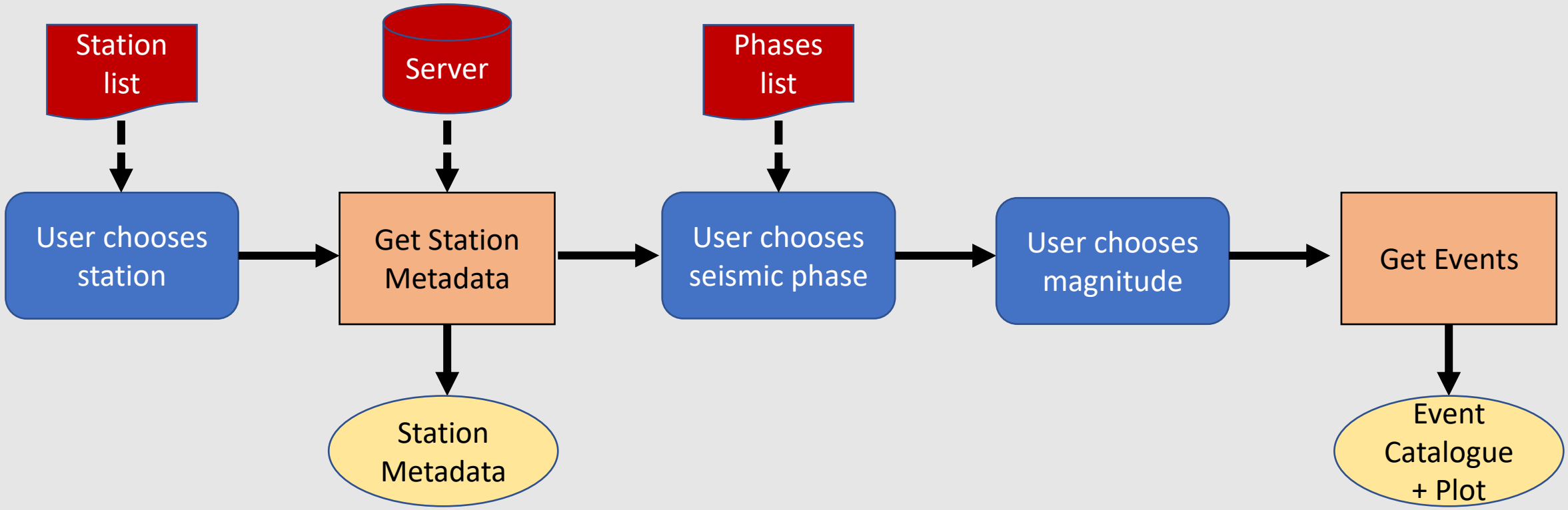
(3) Display waveforms in the appropriate time-window.

(4) Create additional graphics/images (e.g., map of analysed earthquake events)

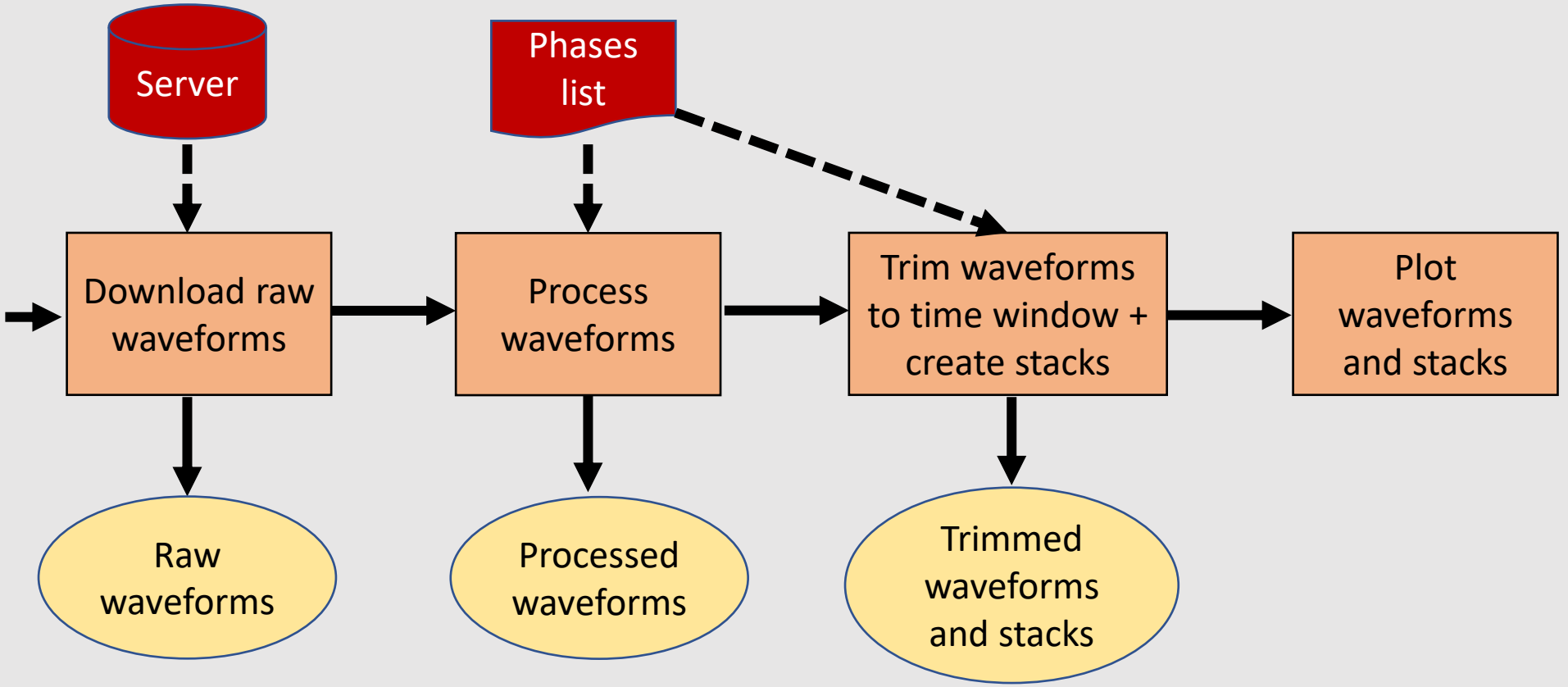
(5) Prevent the user from introducing errors into the programme.

(6) Provide data that can be used for more sophisticated analyses.

Project Flow Overview: Data Acquisition



Project Flow Overview: Data Processing



Demonstration

- Files and overall structure
- Application Notebook
- Input Validation
- Output

Testing and Validation

Input Validation:

- Every input is validated
- Programme only continues when criteria are met
- Help user to make choices

Testing:

- Tests with different inputs
- Exception handling
- More testing needed?

Limitations and Next Steps

Limitations

- Data handling (station data, missing data, …)
- So far limited to PKJKP and PKIKP but can be easily extended
- User Interface

Possible Improvements

- More restrictive user interface (hide cells or whole application)
- Better visualizations
- Notification system
- More sophisticated processing