EMERALD class demo

1. Go to the EMERALD beta test site, emerald.la.asu.edu. Log in using your user name (generally your first initial and last name, all lower case) and your initial password "betauser".

2. Start in the User Settings page. Under Notification Settings at the bottom of the page, make sure your e-mail address is correct. If you know the e-mail address your cell phone provider uses to send you text messages, you can enter that also. Example: Verizon customers use ##########@vtext.com.

3. All work in EMERALD takes place in the context of a DataSet. For this class, I have imported a small set of data into each of your databases. Go to **Menu | DataSets | 1: Short Course Demo**. Note in the page header that you are in **Subset 0: Raw Data**. As you perform additional work on the data, you may process it into a sequence of subsets.

4. Set the notification options for this DataSet, by choosing **Menu | DataSets | Edit Current DataSet**. Use the check boxes to choose whether to receive notifications via e-mail and/or text message. Note ("**log to internal**" does not work at this time.) After saving, go back to the DataSet home page by choosing **Menu | DataSets | 1: Short Course Demo**, or use the shortcut by clicking on the "**DataSet 1:**" link in the header.

5. From the home page for your DataSet, scroll down and note that some event/station pairs have more than 3 traces. Our first task will be to remove duplicate traces.

6. You can look at some of the event/station pairs with duplicate traces by clicking on **Review** under Seismogram Count by Event/Station Pair. You could go through all of the pairs with duplicates and manually reject the traces you don't want to use, but EMERALD provides methods to do this automatically. To automatically reject duplicates, we first need to know the estimated arrival time for a phase of interest and we need to calculate signal-to-noise ratio for each trace, as follows.

7. Under **Menu | DataSets | Phases for this DataSet**, make sure that the phases of interest are checked. For this DataSet, we want to see at a minimum S, SKS, and SKKS.

8. We will then calculate travel times for these phases. Choose **Menu | Calculate | Travel Times (TauP)**. You can select to be notified when the calculation is complete, and can also select to have the calculation run in the background. This calculation should be pretty quick, so it's OK to have both unselected. If you select background you should have notifications turned on, otherwise you won't know when the calculation is complete.

9. To calculate a signal-to-noise ratio for each trace, choose **Menu | Calculate | SNR: Phase-window**. Since this DataSet is from a shear-wave splitting experiment, you will likely want to calculate SNR for the SKS phase. This method calculates the signal power within the defined window around the chosen phase, and then within a sliding window of the same size across the entire trace, and compares the power in the chosen phase window with the minimum value of the sliding window.

10. Once you have calculated the arrival times and the SNR, you can go to **Menu | Calculate | Remove Duplicate Traces**. Choose which phase is required to be in the selected traces and the method used for calculating SNR, then run. This calculation will reject duplicate traces and traces not covering the selected phase arrival, retaining the trace with the lowest SNR.

11. After removing duplicate traces, go back to the DataSet home page. All event/station pairs should now have 3 traces.

12. Look at Events, either clicking on the link on the DataSet home page or going to **Menu | Events**. Note that events aren't named. If you click on an event, you can review traces either from an entire event or by station. At this point, the seismograms are raw, unfiltered, and not trimmed.

13. Give the events useful names, using **Menu | Calculate | Event Names**. Use either YYYY.DDD.HH24.MI.SS or YYYYMMDD as your name pattern. Later when you export data as sac files, the event names will have a part in determining the file and directory naming convention.

14. On the menu, there are **Calculations** and **Processes**. Calculations are defined as methods which create or change scalar values associated with a seismogram, while Processes actually change the time series data.

15. You can create a saved workflow consisting of any combination of Calculations and Processes, in an Automation Batch. To see an example, open **Menu | Automation Batch | SWS Prep**.

16. View the batch details by clicking on the "**view**" link. Note that you have stored settings for each calculation or process, and that you can modify those settings, change the run order, and add or remove calculations and processes.

17. Switch to the run batch page, give the new subset a name such as "SWS prepped". You should select to be notified on completion, and optionally notified as each step is performed. Run the batch; it will likely take a few minutes.

18. On completion of the batch (you will be notified) go to **Menu | SubSets | SubSet 1: SWS prepped**. Note that all events/station pairs now have 5 components, as you have added BHR and BHT.

19. Look at one or more events, which are now trimmed & filtered with arrivals plotted.

20. Since we no longer need the BHE and BHN components, we can eliminate them by going to **Menu | Reduce Dataset | Reject by Component**. Check BHE & BHN and run.

21. Go to an event, and click on the link for **Review BHR Records Accepted(x)**. This page gives you a way to review a lot of seismograms for a given event very quickly, choosing to accept or reject any or all. If you determine that the entire event is unacceptable, you can go back to the event page by choosing Cancel, and next to the button panel you can check to **Reject** the entire event. Clicking on any button except "**Cancel**" in this page will save your changes.

22. In this way you can quickly reject any unsuitable events, stations, or seismograms to leave you with a clean set of data.

23. Note also that under **Menu | Reduce Dataset | Reject by Calculated Value**: you can eliminate traces below a certain SNR, or by any other calculated value. Since you have trimmed and filtered since you last ran a SNR calculation, you will probably want to rerun the SNR calculation first.

24. If you want a clean subset removing all rejected traces, you can easily do this by choosing **Menu | Process | Remove the Mean** and target a new subset.

25. Once you have completely cleaned your dataset and are ready to post-process using external methods, go to **Menu | Export data | Export sac files**. This will export your cleaned set of data, and you will be able to log into the EMERALD server using your EMERALD user id and password and download the files via sftp/scp.

26. There are many capabilities of EMERALD which have not been demonstrated in this script, so please feel free to mouse around and try things.