THE PRESTACK STRUCTURE-ORIENTED FILTERING WORKFLOW

Contents

Introduction 1

How to run 1

Step 1: Save the workflow environment parameters 2

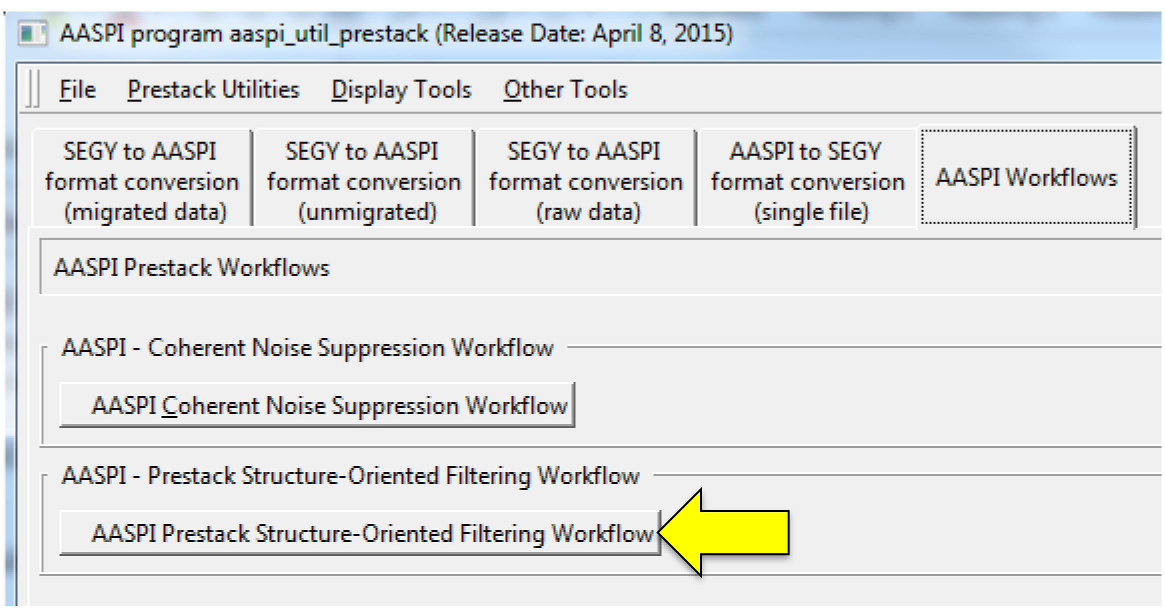
Step 2: Save the parameters for each program 3

Step 3: Execute the geometric attribute workflow 9

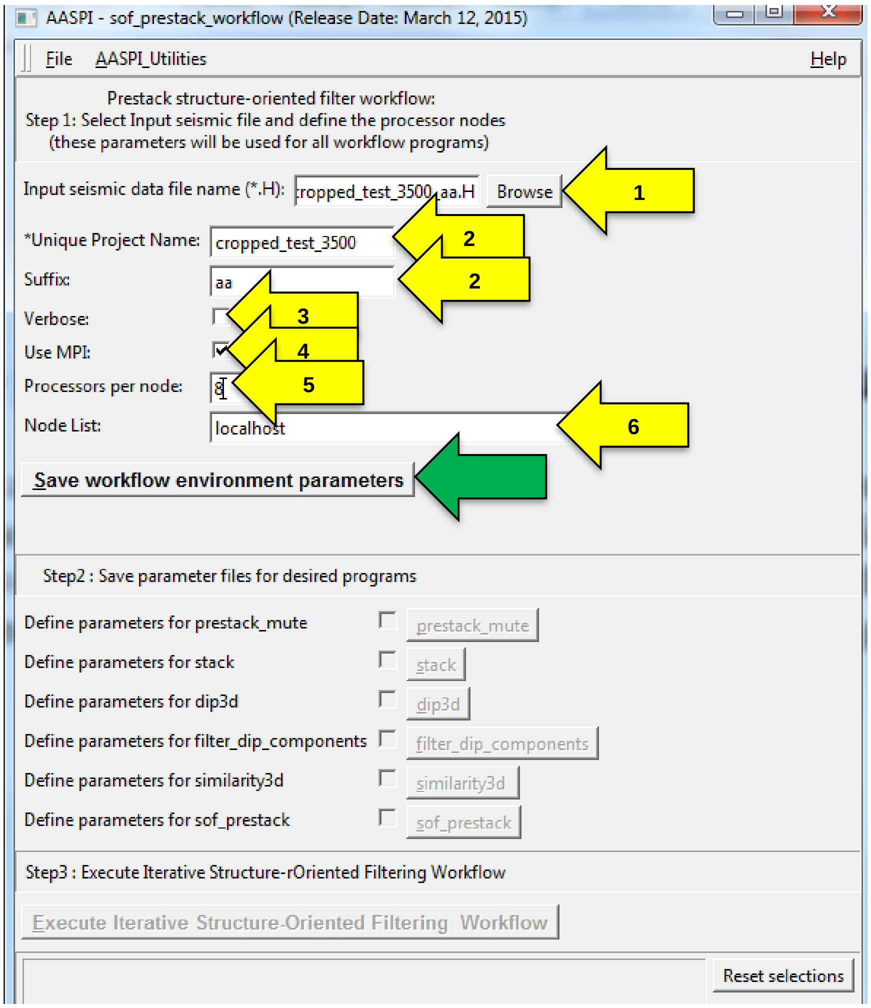
Introduction

Structure-Oriented Filtering (SOF) involve many programs in AASPI software. Particularly, prestack SOF is tedious and time-consuming. To make the task more automatic, we designed a workflow GUI similar to AASPI geometric attribute workflow.

How to run



The AASPI Prestack Structure-Oriented Filtering Workflow GUI can be invoked from the **aaspi_util_prestack** as shown above or by typing in **aaspi_sof_prestack_workflow** separately in the terminal window. The following workflow GUI will then pop up.

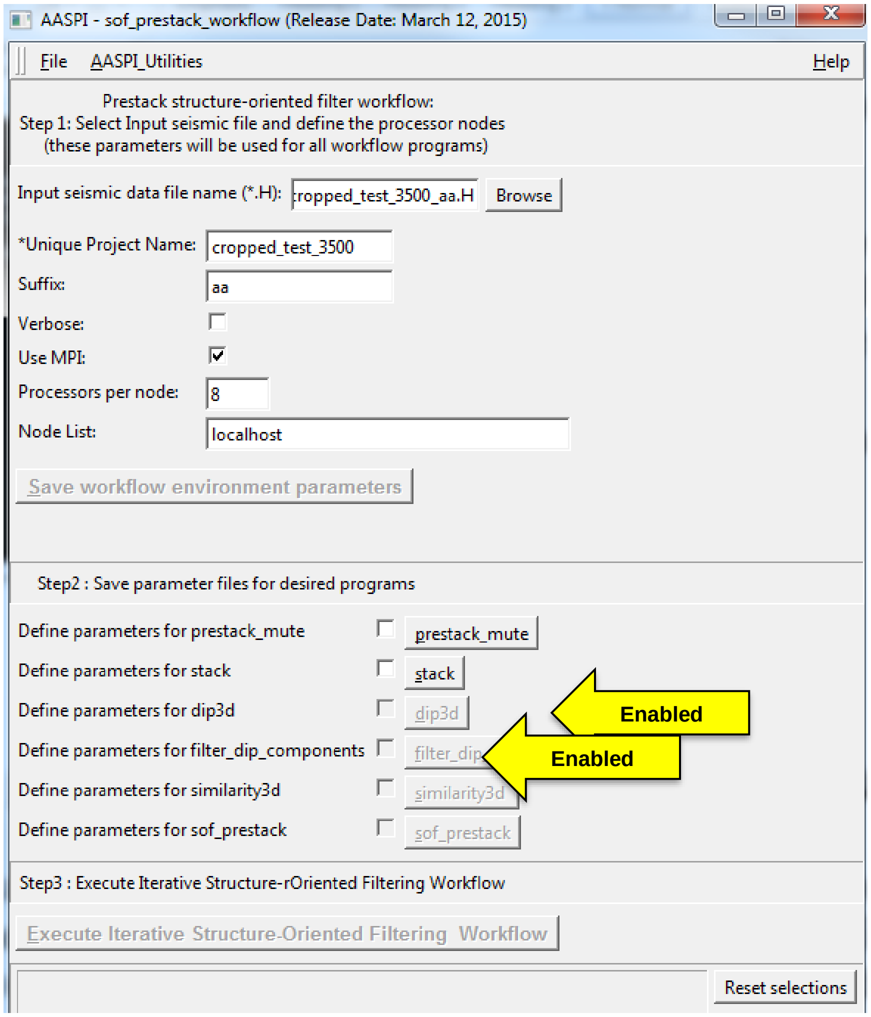


Step 1: Save the workflow environment parameters

In step 1 we need to input the prestack migrated seismic data and set up the project name and the MPI parameters which will be used for all the MPI processes. The seismic amplitude file is selected first (*Arrow 1*). Enter the project name and the suffix (*Arrow 2*). Verbose can be selected if required (*Arrow 3*). It is recommended to use MPI because except for **euler_curvature**, all of the other processes run on MPIs (*Arrow 4*). Mention the processors per nodes and the node list. In this case, we use the local machine with 8 processors, therefore we set the number of processors per node to be 8 (*Arrow 5*) and the node list to be “localhost” by default (*Arrow 6*).

After entering all the parameters, they are saved (*Green Arrow*) and will be subsequently used for all the processes. Note that, initially, all the steps will be disabled. When the “Save

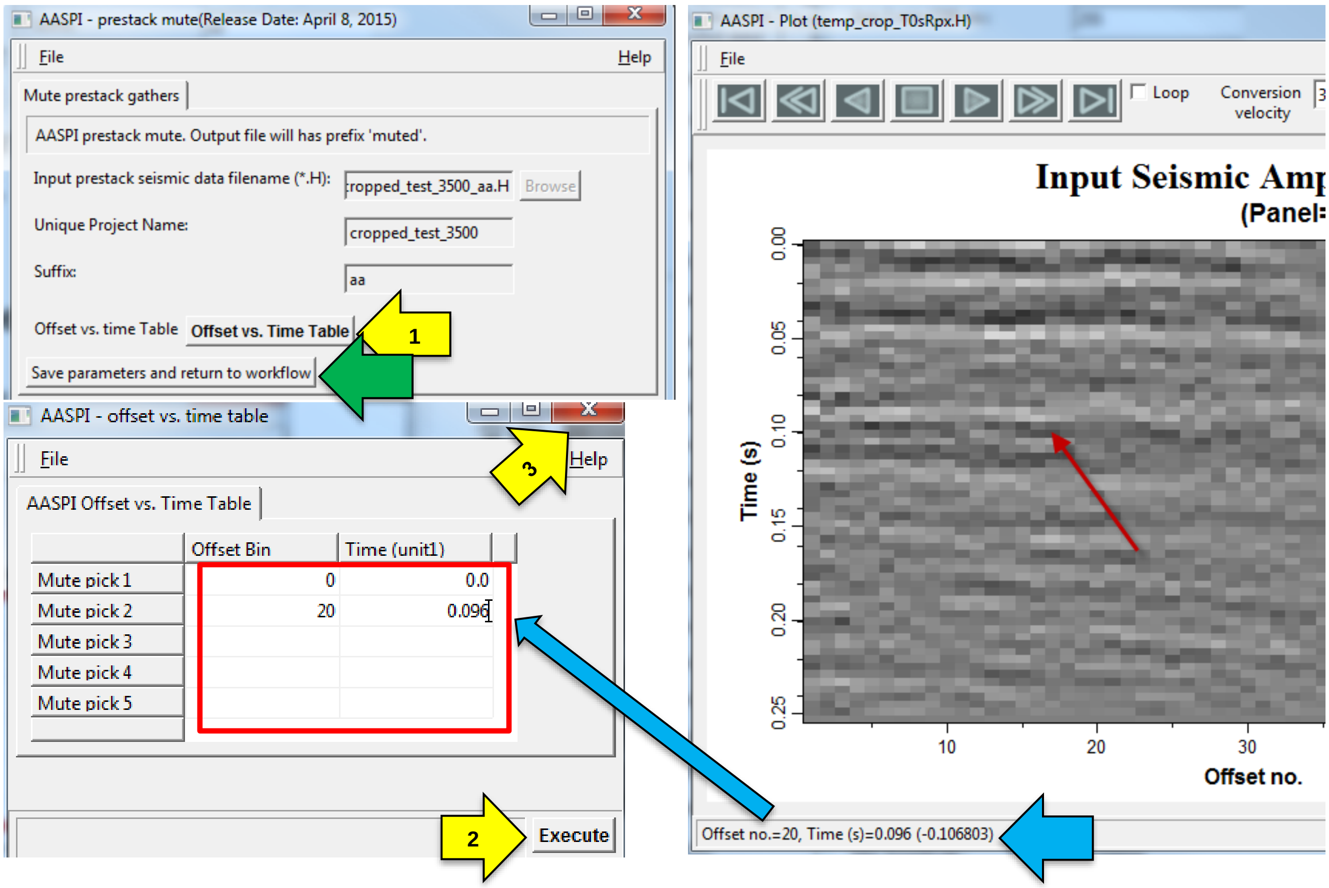
Environment parameters" is clicked the *prestack_mute* and the *stack* buttons will be enabled as shown. These two accepts only the seismic amplitude as inputs and are thus activated. The subsequent buttons will be activated after their input file criterions are met.

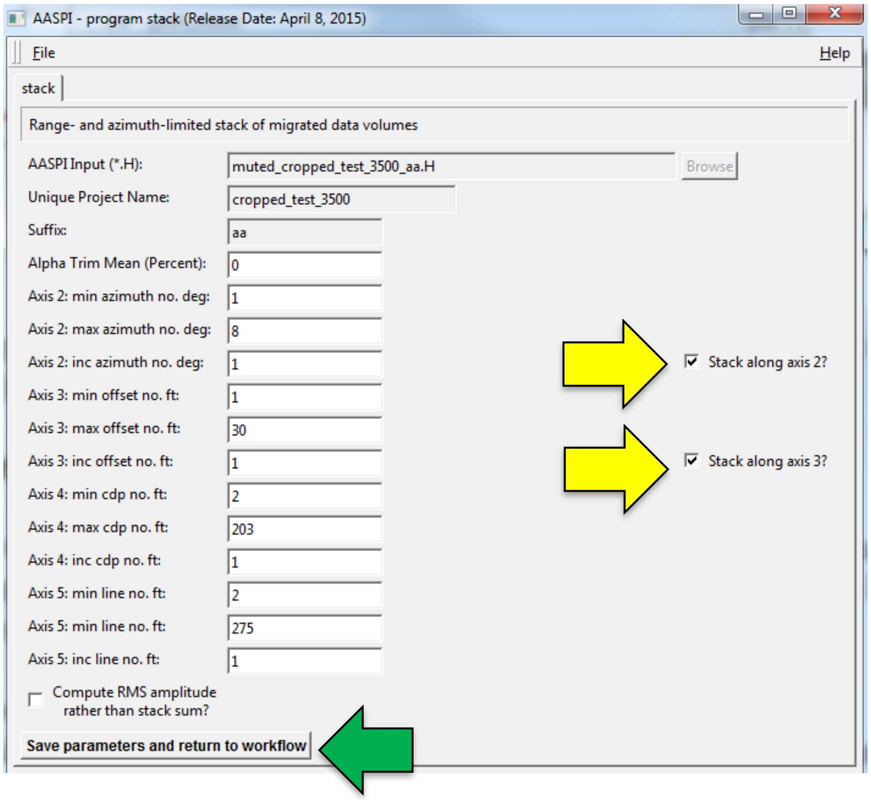


Step 2: Save the parameters for each program

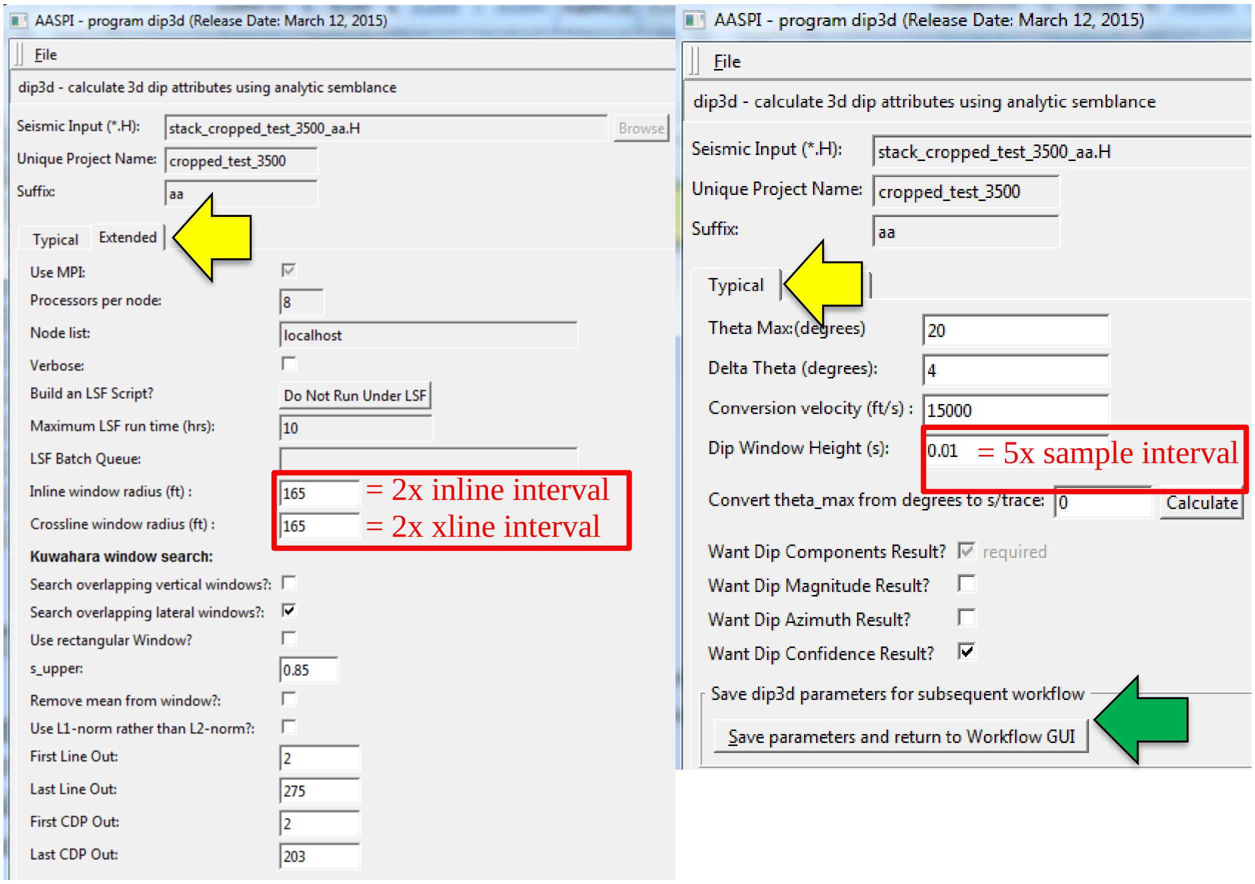
In this step each of the program is opened and their parameters are saved. The buttons are activated only when their input criterion are met. For example, the **dip3d** gets activated only after we open and save the *stack* parameters. The next figure shows the GUIs for **prestack_mute**, **stack**, **dip3d**, **filter_dip_component**, **similarity3d**, and **sof_prestack** programs as an example.

For the **prestack_mute** program, the user needs to specify muting times and offsets by clicking "Offset_Vs_Time Table" button (*Arrow 1*). Up to 5 offset bin-time pairs can be defined for the top mute (*red box*). The top mute is linearly interpolated between those pairs. Offset bin is not in distance unit (ft, m), but rather an axis specifically designed for AASPI-migrated data set. The user can determine the offset bin-time pairs simply by displaying the migrated gather and leftclicking on the position where a mute point is prefered. The offset bin – time pair is displayed in the bottom of the plot (*blue arrow*). These pairs must be listed in increasing order of offset bin. If less than 5 pairs are needed, make sure the unused pairs are blank (i.e. do NOT put zeros there). After the table is set up, click *Execute* button (*Arrow 2*) and close the offset-vs-time table GUI (*Arrow 3*), then save parameters for **prestack_mute** (*green arrow*).

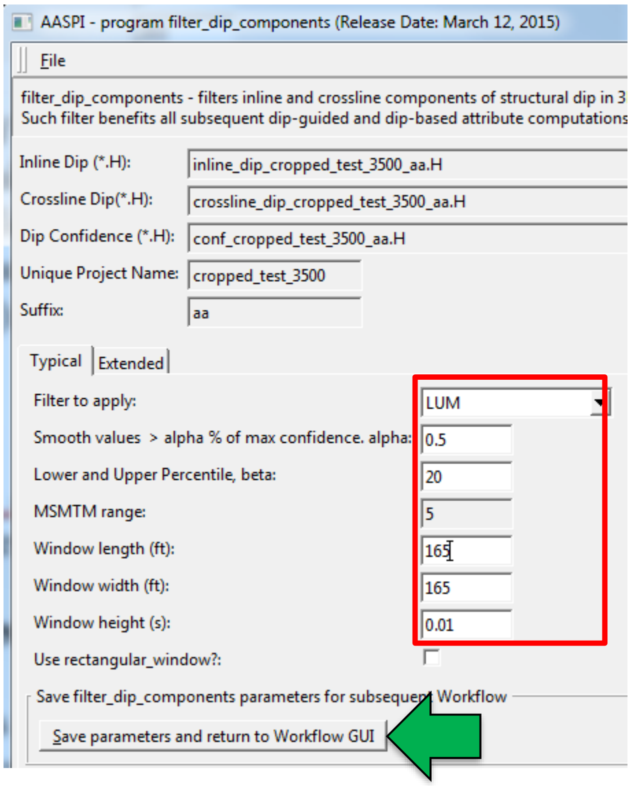


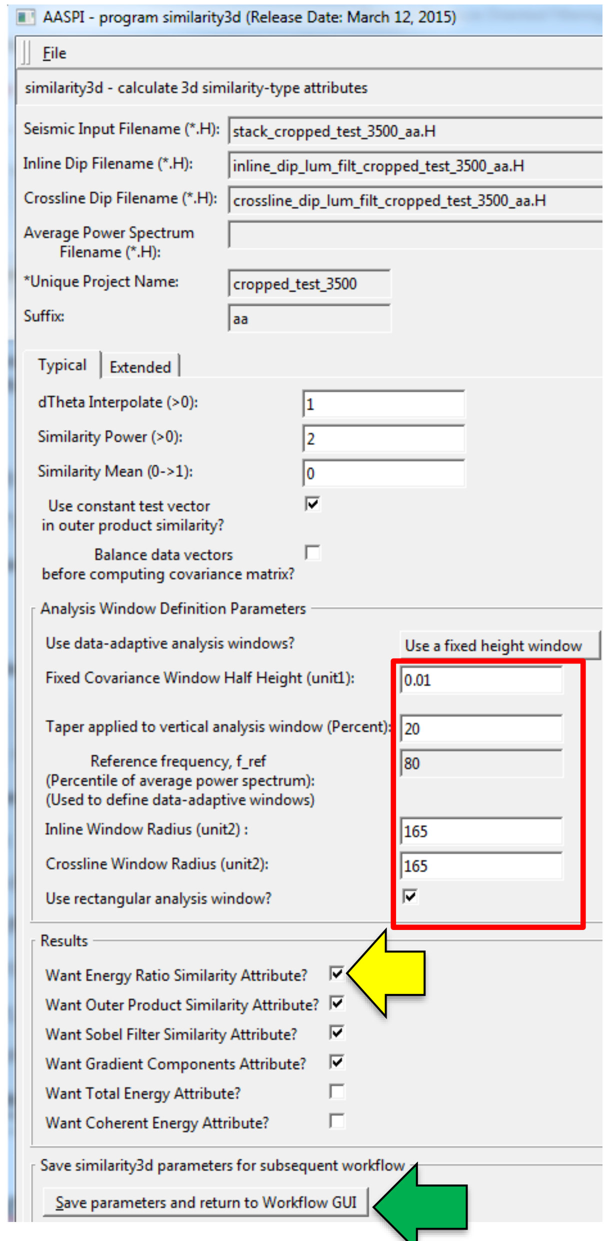


For the **stack** program, it is required that the result is fully stacked (i.e. stacked in both offset and azimuth direction). Thus, make sure all the “Stack along axis x” are checked (*yellow arrow*). Then hit save parameters (*green arrow*).



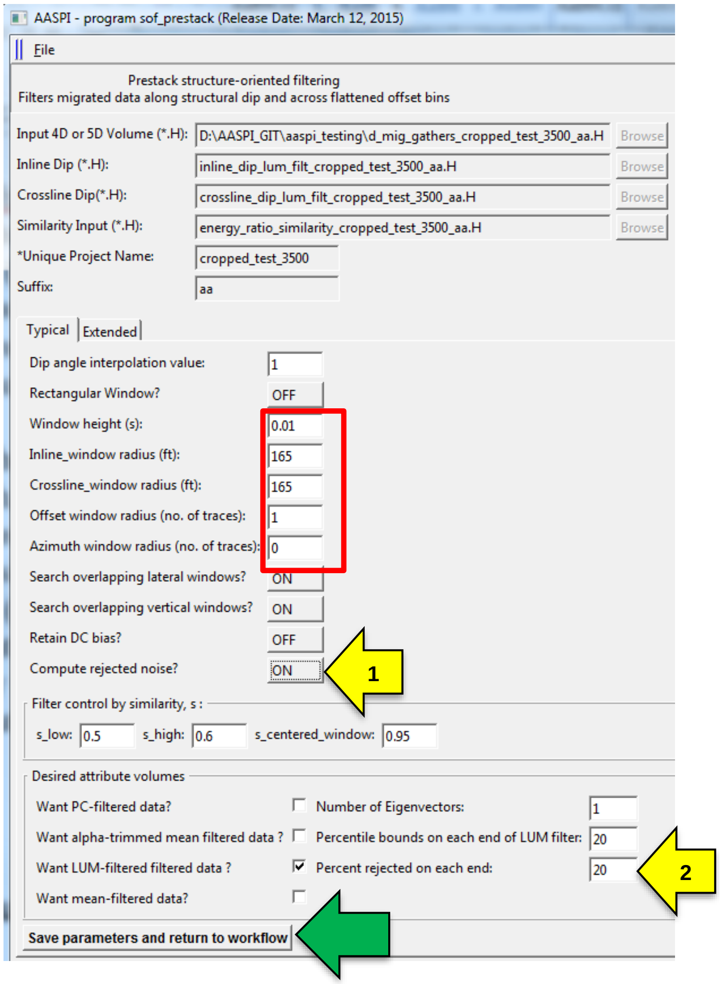
For the **dip3d** program, it is recommended to set up inline and crossline windows radii (under "extended" tab) to be twice as much as cdp and line intervals (red box). This will further enhance the filter while only moderately increase computational effort. After that, go back to "typical" tab. Recommended dip window height is 5x sample interval. Next, save parameter for **dip3d** (green arrow).



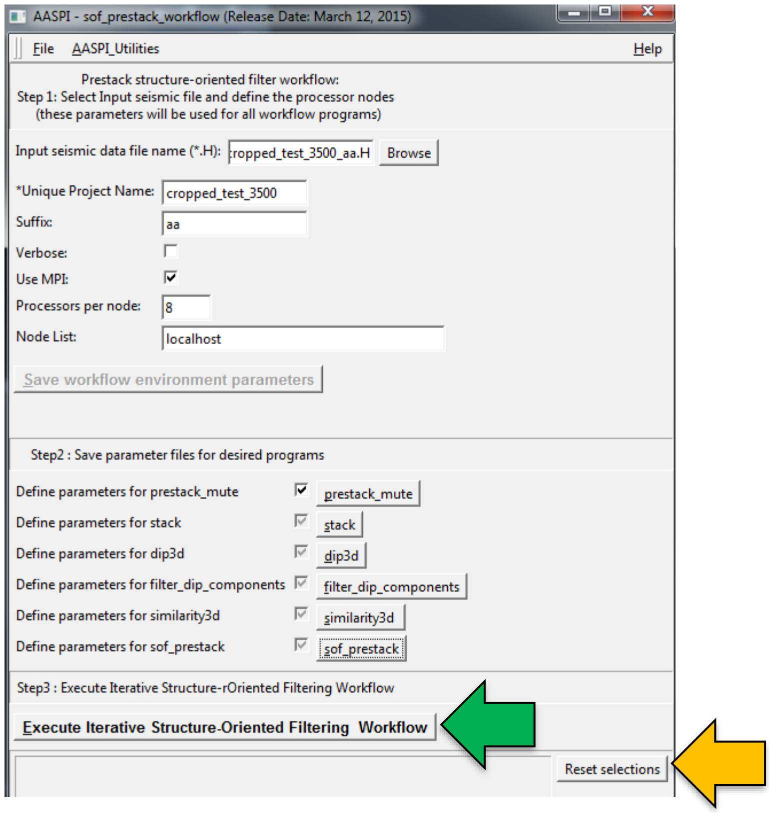


For the **filter_dip_component** program, it is recommended to use LUM filter type in order to preserve edges (such as faults). Also, it is a good practice to set window length, width, and height to be the same with **dip3d** program (*red box*). Then hit save parameters (*green arrow*).

Similarly, for the **similarity3d** program, windows length, width, and height should be kept the same as in **dip3d** (*red box*). The recommended similarity for SOF filter is energy ratio similarity (yellow arrow), but the user can choose different type of similarities. Note that if multiple similarity types are selected, only the highest-priority similarity volume is used for SOF filter. The priority is listed in decreasing order, from energy ratio, outer product, to sobel filter similarities. In this case, only energy ratio similarity is used by **sof_prestack** program.



For the **sof_prestack** program, again, windows length, width, and height should be consistent with **dip3d** program. Since it is very computationally intensive for the program to filter along offset direction, it is recommended that maximum offset windows radius is 1 (*red box*). The user can choose to smooth along azimuthal direction, but it is not recommended for survey that exhibits anisotropy because we want to preserve the azimuthal displacement caused by anisotropy. If the user wants to see the difference between original data and filtered data, “compute rejected noise” should be turned on (*Arrow 1*). It is also recommended to output LUM-filtered data instead of PC-filtered data to preserve edges (*Arrow 2*). Next, hit save parameters (*green arrow*).



Step 3: Execute the geometric attribute workflow

After all the parameters are set up for all the sub programs, click the execute button to start the workflow (*green arrow*). If the user wants to reset parameter settings, click “Reset selections” button (*orange arrow*) and start over again.