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Pattern From Spectra

PatternFromSpectra (PFS) is a new beta feature that uses measurement variability against MUSIC bearing response of an idealized pattern in order to create a pattern that is far more matching to the measurements. By its nature, the resulting pattern will likely contain some bearing biases versus a real pattern measurement, so it is highly suggested that you check with Codar Support before using.

PFS runs separately from Radial processing and the results are contained within Data/PatternsFromSpectra folder. SeaSondeAcquisition outputs an extra CSQ into the folder and is processed by the PFS script. There's a simple configuration file in RadialConfigs called PatternFromSpectra.plist. The processing produces raw loop files, rough patterns, and diagnostic (.rdt) files. PFS requires antenna bearing, coastline cutoffs and sometimes a better hint about antenna phases, covered below. It cannot correctly handle swapped antenna channels; it will likely make a pattern that is flipped or rotated. Weak Bragg and currents may make the result less stable and may require manually processing of the loops over longer time periods.

In order to get best results, antenna bearing should be as accurate as possible. Any siting offset will rotate the PFS pattern by that amount.

PFS uses the Wave coastline cutoff angles in order to limit its diagnostics and pattern generation. You can sometimes get valid bearings back over land, but it is not common and is only a small fraction of vectors over the water, so please be sure to enter the coastline angles in SeaSondeRadialSetup in the Waves tab. Note, it is possible to examine the PFS loop data for coastline coverage.

PFS starts off by examining the cross spectra phases and amplitudes and this is where processing can go wrong; typically wrong phases results in PFS placing the pattern overland. An ideal cross loop antenna pattern has a forward looking phase and a backward looking phase for each loop. When the antenna is pointed out over the water and cable lengths are equal as shipped by Codar, then the expected phases of each loop for the forward looking lobe are expected to be equal. Often for sites, the Loop1 will have good coverage over water and little to no coverage behind the antenna while Loop 2 will often see coverage on both its forward and backward facing lobes. This tends to make the Loop 2 phase determination more unstable. For this reason, the default configuration tells PFS to trust loop 1 phase more than loop 2. If loop 2 phase is more than a 120 degrees away from loop 1 then it assumes loop 2 is from the back lobe phase and adds 180 degrees. Sometimes this assumption does work because the antenna bearing does point out near the center of water coverage or cables are mismatched or antenna pattern is so highly distorted, it's difficult to determine what the ideal phases should be. The following is a setting which can help.

In PatternFromSpectra.plist is a Phases_Trust key which tells PFS how to use the phases determined from the cross spectra. Set to one of these values:

0	Use phases as is.
1	Trust Loop 1 phase more. If Loop 2 is >120 degrees away, add +180 to loop 2 phase
2	Trust Loop 2 phase more. If Loop 1 is >120 degrees away, add +180 to loop 1 phase
3	Add +180 to both phases. Maybe antenna is pointing back over land.

If you think PFS needs more than a hint, then In PatternFromSpectra.plist Phases_Fixed key can be entered with exact phases to start with for loop1 and loop2 separated by a command (don't use spaces). Leave this entry blank, for Phases_Trust to be used.

PFS does a three step iterative processing of spectra into patterns. The steps are named 1:Simple 2:Basic and Step 3:Detailed.

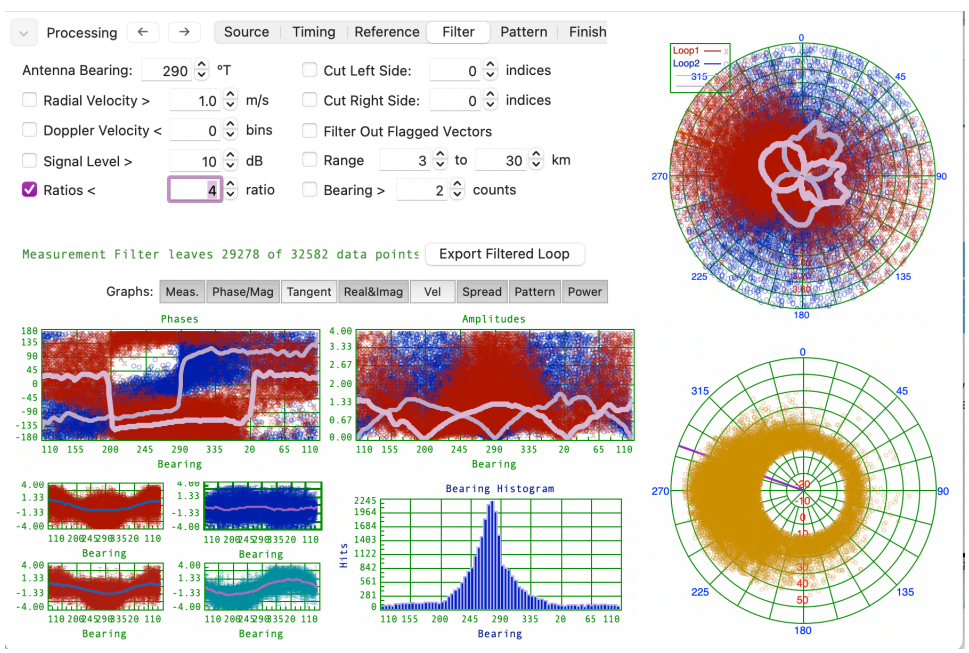
Step 1: Simple starts with an ideal seed pattern from spectra phases and amplitudes. This generates a loop discrepancy between the ideal pattern and antenna measurements to create a temporary pattern that it uses solely to revise the initial phase and amplitudes. These revised phases and amplitudes are used to create a new ideal seed pattern which is used to generate a new loop discrepancy and pattern whose loop and pattern outs are stored into sub folders named Simple. These Simple Loop files appear to provide the best ideal of Signal to Noise coverage over the ocean. Looking at the bearing histogram where the number of hits is 12% of the peak, is a good indication of the coastline coverage that the SeaSonde is receiving.

Step 2: Basic uses the Simple pattern as a seed to generate a new pattern. This pattern will have a little more detail than the simple one.

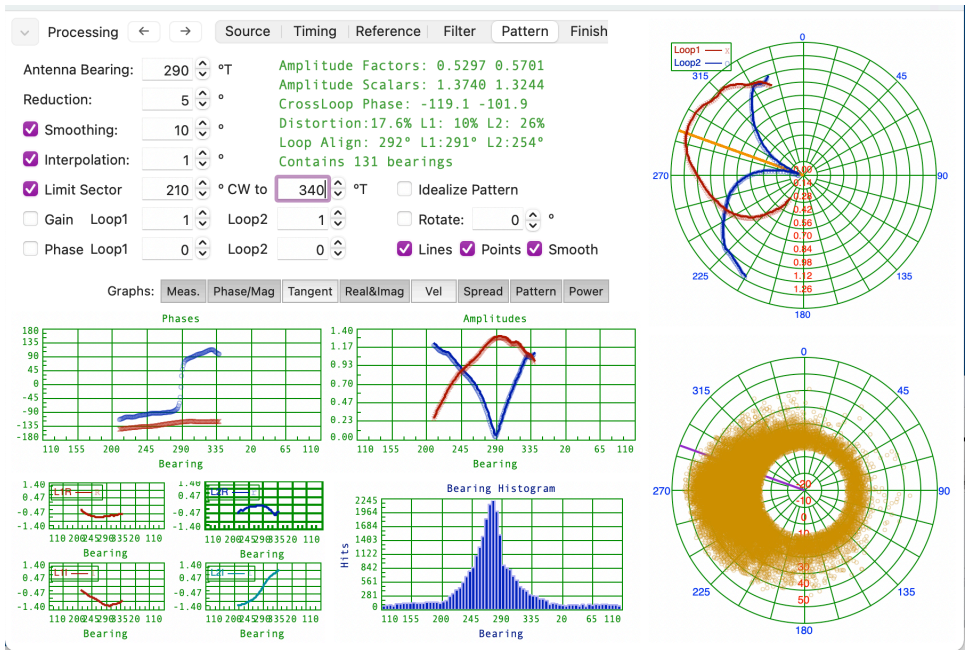
Step 3: Detail uses the Basic pattern as a seed to generate a new more detailed pattern which might contain more pattern features. This

You can drop the loop and pattern files onto CrossLoopPatterner for examination. Also more than one pattern can be dropped on CLP, if you want to average them over a longer time. Start with 20 loop files dropped on to CLP; the more files you drop the longer it takes to process them as there is lot of data.

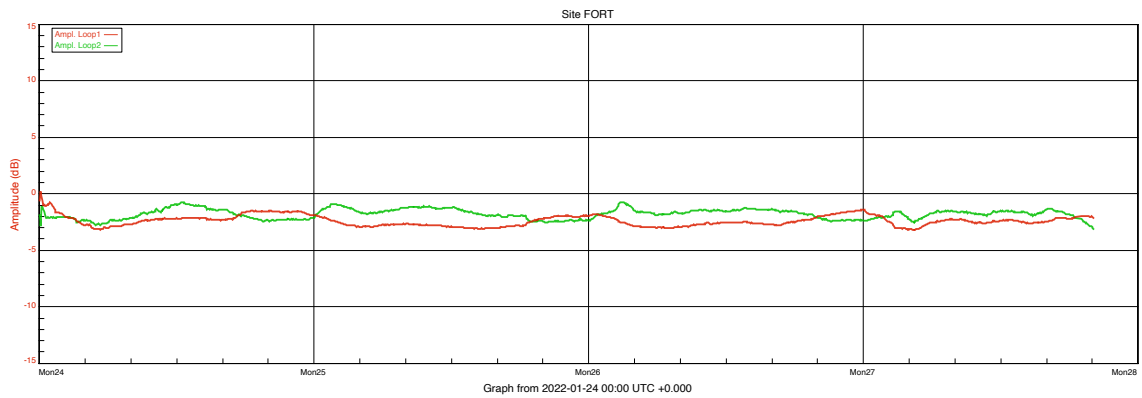
Here's an example site. While these plots show the wide spread of measured data, they don't show the density; that is most measurements are much closer to the lighter lines shown which is the average. From the blue histogram below in the center graph, you can see that the coverage drops off from the peak response to around 210 to 345 T at the 12% of points. The pattern result looks pretty good but don't trust it much on the land side as there isn't enough data back there for the pattern to be stable.

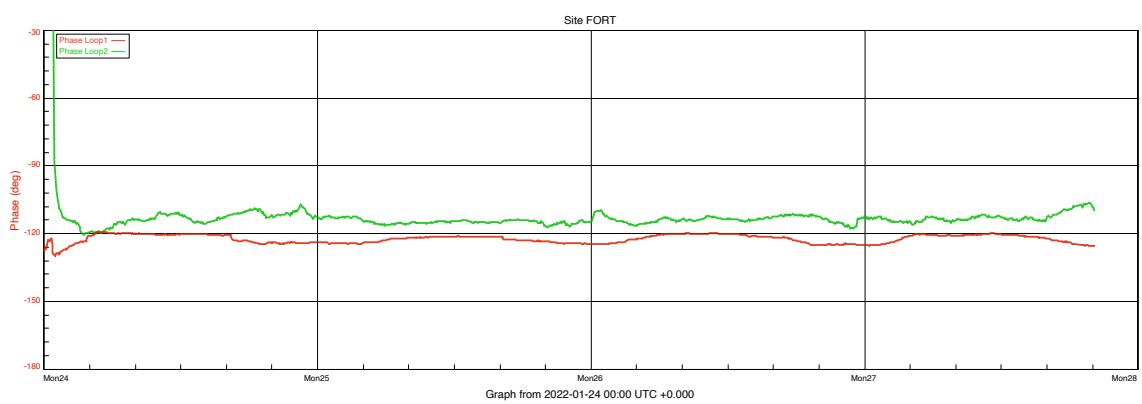


Cutting the pattern at 210 to 345 T results in this.



The diagnostics show a small amount of daily fluctuation on the amplitudes and phases.





Revision History

Mar 9, 2022 - New

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