

Notes from PI discussion of FITACF-3.0

For the most part the group views the new FITACF very favorably. The increased number of “good” fits for the majority of the radars is a valuable accomplishment. Elimination of a number of ad hoc assumptions in the fitting is also a good step and makes our analysis more statistically defensible.

The PI Executive Council agrees that we should work toward adoption of FITACF-3 as our standard processing routine. Prior to doing so, however there are a few items we would like to see addressed.

(1)

The most significant item of concern is that the routine accepts a number of fits at isolated points for some of the radars. These isolated fits give the appearance of noisy speckle in data plots. Pasha and Emma have done a thorough analysis of the issue and determined that it arises due to problems with some of the radars rather than problems with the fitting. They’ve written a despeckle routine to accompany FITACF, which does a good job of eliminating most of the speckle. Unfortunately, despeckling can have the negative side effect of removing valid fits to meteor scatter. To address the speckle problem the PIs would like the following actions:

The despeckle routine should be incorporated into FITACF-3 as an option that is selected with a command line flag, with the default behavior being to not do the despeckle.

Fitted data that is distributed to the broad community through database access should be despeckled before being placed on the database.

(2)

The second thing the PIs would like to see is a better demonstration of the improvement that FITACF-3 provides and more analysis of the speckle problem. With this analysis we will have objective criteria as a basis for a decision to adopt the new routine. A number of days should be analyzed using FITACF-2.5 and FITACF-3. The selection of days for testing should include full day coverage, and a range of frequencies (if relevant for the radar, e.g. day/night switching) The analysis should be carried out for each radar and should include the following:

Number of valid fits

Number of isolated points that are most likely not valid fits

Number of valid fits after despeckle

Number of isolated points after despeckle

Scatter/contour plots of the three main parameters (power₁, velocity, and width₁). The horizontal axis should be v2.5 and the vertical axis should be v3.0.

Average difference between parameter values determined by the two routines (e.g. |v2.5-v3.0|)

Standard deviation of parameters calculated for distribution of parameter values for each routine.

(3)

Reverse the decision to remove the XCF data (and related fields) from the FitACF files. In the PI meeting it became clear that the XCF data have been used by many PI groups on a number of occasions. Hence, there appears no rationale to remove it from FitACF3.0 files.

(4)

The suggested change to the determination of elevation angles presented in the white paper (i.e. using the lag 0 phase rather than the fitted phase) needs to be justified better and fully proven that it is an improvement on the existing methodology. In addition, the suggested way of re-using the existing elevation variables (e.g. elv_low, elv_high) is a fudge and likely to cause confusion of what these variables represent in the future.

These changes to the elevation angle determination and to what the variables represent are significant, the consequences of which need to be fully understood before any such changes are made part of FitACF3.0.

(5)

Here is a link to an issue that Simon raised a long time ago about noise and FitACF3 (<https://github.com/SuperDARN/rst/issues/208>). There was some good discussion but ultimately the issue was closed “because it's not really possible to resolve it with our current understanding of SuperDARN noise sources.” Perhaps our understanding has improved. We would like to see how the despeckling and/or other new features can handle this specific case.