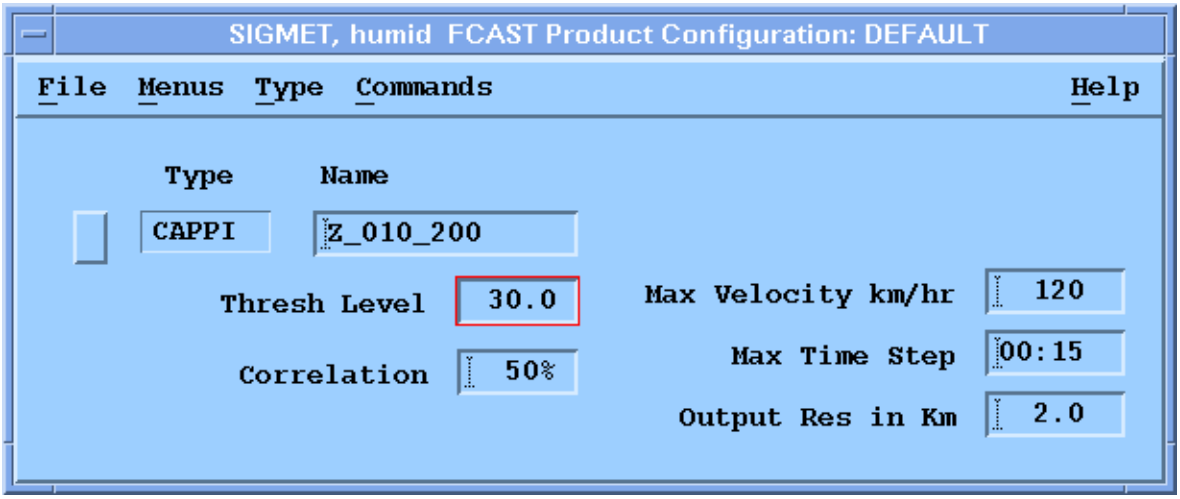
2.5 FCAST: Forecast

The Forecast product is used in the Quick Look Window to project other products forward in time to see a “future” look at the weather. The product takes as input another image product and then determines an average speed and direction of echo motion. It is similar to the automatic TRACK product in that it computes the mean speed and direction by doing a cross-correlation between the current and the previous version of the product.

The product configuration menu also has many fields in common with the TRACK product described in Section 2.17. The menu fields are described below.



Input Product Selection

Use the **Type** button to select a product type and name. Select a product that will produce a reasonable echo motion. If you are using the product to forecast the motion of a VIL features, then you could base the forecast on a VIL product. In the example a CAPPI product of dBZ is selected.

Threshold Level

The algorithm applies a weighting function to the data based on this level. Values above this level are amplified and values below this level are suppressed by the weighting function. When you choose the level, look at a display in loop mode and get a feeling for what color boundary moves in a representative way. Usually you want to select a weak value so that you can be sure that it will always be present when there are echoes. In the example, 30 dBZ is selected.

Correlation

The correlation algorithm will return a speed, direction and a correlation value which serves as a quality indicator. The value that you enter here will be used as a threshold. If the calculated correlation value in the product is larger than the threshold that you

set, a forecast product is generated. Otherwise no forecast product is generated. The example requires a correlation of 50%. A larger value would be more restrictive. A smaller value would be more likely to pass unreliable motion estimates when the data are noisy.

Max Velocity in km/hr

It is also possible that the forecast product has a sufficiently high correlation, but makes an absurd velocity perhaps because of random noise. To prevent this, enter the maximum velocity that you would expect to see for weather echoes in your area. A value of 120 km/hr is a reasonable first guess.

Max Time Step

The Forecast product calculates the mean echo motion by doing a correlation between the current and previous image. Max Time Step is the maximum time that the Forecast product will look back to find the previous image. The example value of 15 minutes is a reasonable starting point since the average life of an individual convective cell is approximately 30 minutes.

Output Resolution

The current version of the forecast product produces a single motion vector. However, future versions will compute a field of motion vectors. In addition, users can make their own forecast product using their own algorithms. These can have a field of non-uniform motion vectors.

The Output Resolution is the resolution of the output field of vectors. The total size of the output field will match the size of the input product (in km). For example, if the input product has a 200 km range (400 km total span), and the output resolution is 5 km, then the output will be a grid of 80 x 80 motion vectors.

Display and Use in Forecasting

The display of the forecast product itself shows an array of motion vectors similar to the WIND or NDOP products. In the current version of the FCAST product, all motion vectors are the same.

The most interesting display is when the FCAST product is used to shift the display of another product. This is done using the Quick Look Window Forecast tool (see **Section 5.13**). The QLW displays support additional features that are not currently supported by the Forecast product made by IRIS:

- Non-uniform motion fields will be correctly used in the forecast.
- Non-uniform intensity changes will be correctly applied.

With regard to the second point, the forecast product creates a corresponding array of intensity changes. In the case of the current implementation these are all set to 1.

Forecast Algorithm in Quick Look Window

The forecast algorithm in the Quick Look Window takes as input a product and a forecast product (array of motion vectors and intensity changes). Also please see **Section 5.13.** The steps involved in the forecast are as follows:

- An output array is created that has the same projection and resolution as the input product (e.g., an input CAPPI that we want to forecast).
- The forecast product motion vectors and intensity change array points are re-mapped onto the output array. This re-mapping means that the input product and the forecast product do not have to have the same projection, resolution or range.
- Usually there will be many more output array pixels than there are grid points in the forecast product. Therefore it is necessary to interpolate the spares motion vector and intensity change points to each pixel point (pixel) in the output array. The result is that each pixel of the output array now has a a motion vector and an intensity change associated with it.
- For each pixel of the output array, the motion vector is used to “look back” in time per the selected forecast time. This “backwards displacement” vector points to a pixel in the adjusted input product. The value of this pixel is then used for the output product pixel.
- The intensity changes in the output array are then applied pixel-by-pixel to adjust the data for growth and decay.