Angle-Corrected Data Products.

Output includes Velocity (vzi), Intensity (izi) and Magnetogram (bzi) images that have been calibrated with the following **Processing and Acceptance** steps:

- A full observing day (siteday) of observations is staged to process at one time, reading the data in from the raw-data rif files.
- Multiple stages of acceptance testing, beginning with inspection of multiple FITS header parameters, are applied.
- The calibration images are selected and applied uniformly to the entire observing day of data. The six-plane rif data are reduced into raw measurements for Velocity (vzi), Magnetogram (bzi), Intensity (izi) and Modulation (mzi); initial limb geometry is computed with FNDLMB keyword value.
- Next-round acceptance testing is applied to the computed observation limb geometries.
- Precise ephemeris values are applied to the data headers, including B0, L0, VCOR1, etc.
- The third round of acceptance testing is run, primarily using statistics computed from the raw rif images, and incorporating acceptance thresholds that are applied to model fits as a function of hour-angle to all so-far accepted observations for the siteday.
- Flat-fielding is applied to the intensity images.
- More precise limb geometries (ellipse fit and improved estimate of the image size) and mtf data are computed.
- VELSCALE and VEL_BIAS are computed and applied to all observations for the siteday.
- A suite of quality-check plots is run and the plots are reviewed by science and data-center operators as a final round of acceptance testing to ensure that all bad observations have been removed from the siteday dataset of the bzi, izi and vzi images.

Following **Processing and Acceptance**, additional steps are taken to prepare the measurements for use in **Merged Network Products**.

- OFFSET keyword is applied to the FITS headers which supplies the appropriate Camera Offset Angle for each observation for precise image alignment. Site-specific Ronchi gear-angle corrections and network-based seasonal angle corrections computed for each site, date, and hour-angle are applied to bzi, izi and vzi single-site data.

- Merge concurrent site data for each minute:
    - Appropriate Velfit and polarity corrections to the vzi and bzi data are applied.
    - A 5^{th}-order polynomial is used to subtract a surface fit from the vzi data, removing the solar-rotation component of the velocity.
    - Images are translated from GONG orientation (N to the right, E to the bottom) to sky orientation (N to the top, E to the left).
    - Interpolation is used to translate the image from an angle-OFFSET, elliptical geometry to a circular image of a fixed radius with the solar-rotation axis aligned to the image y-axis.
    - Concurrent vzi and bzi images from multiple sites are merged using a simple flat average. Image Merge is not implemented for izi data.

When downloading **single-site data**, be aware that:
- The images are not properly aligned (**not angle corrected**) and OFFSET keyword has not been applied to the data headers.
- The following corrections have not been applied (they are applied to Velocity and Magnetogram images as a part of the **Processing and Acceptance** procedure before merging the data from different sites of the GONG Network):

- **Velocity (vzi):** the line-of-sight velocities require a scaling correction using VELSCALE and VEL_BIAS (in vzi FITS headers), so that:

V_m/s = V_raw * VELSCALE - VEL_BIAS

- **Magnetogram (bzi):** the data report longitudinal flux approximately, in BZI-units, where 1 Gauss = 0.352 BZI. Before use they should have the scaling correction, VELSCALE (in bzi FITS headers), applied, as well as the potential polarity correction BPOL, so that:

B_BZI = B_raw * ABS(VELSCALE) * BPOL

Then, B_BZI is converted to Gauss. The Magnetogram data are **not Zeropoint corrected** and thus unsuitable for Magnetic Field Modeling.

- **Intensity (izi):** center to limb intensity variation (limb darkening) is not corrected (the limb-darkening profile coefficients are in the izi FITS headers).

QuickReduce Near Real Time Products.

- 10-min averages of Magnetograms and Intensity images
- 1-min Velocity (fqi) and Merged Velocity images (mrfqi) for Farside map construction

QuickReduce data differ from the **Angle-Corrected** data in the following ways:

- Different image rejection criteria, based on 10-minute blocks of observations.
- Data reduced using the most-recently acquired calibration images, which may be sometimes updated multiple times a day.
- Does **not** include VELSCALE and VEL_BIAS correction for Velocity and Magnetogram data as QuickReduce may use multiple different calibration images across an observing day. For **QuickReduce Magnetogram** data, the potential polarity correction is still applied and the data are converted to Gauss.
- Does **not** include camera-angle correction.
- Includes Magnetogram Zeropoint correction, for Zeropoint-corrected product sets. The **QuickReduce Zeropoint-corrected** products are suitable for Magnetic Field Modeling and should be the preferred choice for Magnetic Field Analysis.