# Ring Diagram Pipeline

Status 11/5/2007

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- Task: Using ring-diagram analysis, produce time series of full-disc and synoptic tachograms and sound-speed perturbation maps from surface to depths of 30 Mm
- Input: Tracked tiles of HMI Doppler data, and possibly continuum intensity

# Ring Diagram Pipeline

- Data Products
  - tiled mosaics of power spectra (intermediate)
    - hmi.LHV_tiled_5deg, hmi.LHV_tiled_10deg, hmi.LHV_tiled_30deg
  - tiled mosaics of power spectra fits
    - hmi.LHV_5deg_ringfits_dyn, hmi. LHV_15deg_ringfits_dyn, hmi. LHV_30deg_ringfits_dyn
    - hmi.LHV_5deg_ringfits_str, hmi. LHV_15deg_ringfits_str, hmi.LHV_30deg_ringfits_str
  - sub-surface flow maps
    - hmi.LHV_ssflow_disc_hr, hmi. LHV_ssflow_disc_mr, hmi.LHV_ssflow_disc_lr

# Ring Diagram Pipeline

- Modules
  - pspec3 – 3-d power spectrum of surface-time data cube
  - ringfitf – “fast” fitting of ring diagram spectra for sub-surface flows
  - ringfitc – “comprehensive” fitting of ring diagram spectra for sub-surface structure
  - rdvinvrt – inversion for flows only
  - rdvsmooth – smoothing of flow inversions at different resolutions
  - rdsinvrt – inversion for thermal structure (and flows)

# Ring Diagram Data Products

| series | module | cadence (sec/rec) | size (MB/rec) | Tape | Retain (days) | Description |
|---|---|---|---|---|---|---|
| | | | | | | |
| hmi.LHV_5deg_spectra | *pspec3* | 12 | 23 | No | 55 | mosaics of the power spectra of the tracked tiles in the series hmi.LHV_tiled_*N*deg, with 1-to-1 mapping of most parameters |
| hmi.LHV_15deg_spectra | *pspec3* | 350 | 610 | No | 55 | |
| hmi.LHV_30deg_spectra | *pspec3* | 2800 | 4900 | No | 55 | |
| hmi.LHV_5deg_ringfits_dyn | *ringfitf* | 12 | 0.5 | No | 275 | mosaics of the "fast" ("dynamics") fits to the power spectra in series hmi.LHV_*N*deg_spectra |
| hmi.LHV_15deg_ringfits_dyn | *ringfitf* | 350 | 0.5 | No | 275 | |
| hmi.LHV_30deg_ringfits_dyn | *ringfitf* | 2800 | 0.5 | No | 275 | |

# Ring Diagram Data Products

| series | module | cadence (sec/rec) | size (MB/rec) | Tape | Retain (days) | Description |
|---|---|---|---|---|---|---|
| | | | | | | |
| hmi.LHV_ssflow_disc_hr | *rdvinvrt* | 32700 | 0.2 | Yes | 1825 | full-disc maps of the sub-surface flows at high, medium, and low spatial resolution, at 4, 10, and 16 depths respectively; inferred from inversion of the ring-diagram spectral fits in series hmi.LHV_*N*deg_ringfits_dyn and smoothing<br><br>Mission Data Products |
| hmi.LHV_ssflow_disc_mr | *rdvinvrt, rdvsmooth* | 98100 | 0.05 | Yes | 1825 | |
| hmi.LHV_ssflow_disc_lr | *rdvinvrt, rdvsmooth* | 196200 | 0.015 | Yes | 1825 | |
| hmi.LHV_5deg_ringfits_str | *ringfitc* | 12 | 1 | Yes | 275 | mosaics of the "comprehensive" ("structure") fits to the power spectra in series hmi.LHV_*N*deg_spectra |
| hmi.LHV_15deg_ringfits_str | *ringfitc* | 350 | 1 | Yes | 275 | |
| hmi.LHV_30deg_ringfits_str | *ringfitc* | 2800 | 1 | Yes | 275 | |

# Ring Diagram Pipeline

## Modules

| | |
|---|---|
| *pspec3* | DRMS port of SOI module *powrspec3*; needs to use new FFT library |
| *ringfitf* | Port of outside code (D. Haber); needs some development |
| *ringfitc* | Port of SOI module *ringfit*; needs development |
| *rdvinvrt* | Port of outside code (D. Haber); needs some development |
| *rdvsmooth* | New code |
| *rdsinvrt* | Port of outside code (S. Basu); needs development |

# Ring Diagram Pipeline

Status
– pipeline plan well-defined, except for production of thermal structure products
– porting of module codes has only just begun
– need test data
– need schedule

Concerns
– CPU requirements poorly known, could be substantial
– some module codes need substantial development
– may need to analyse intensity as well as Doppler signal for data near limb