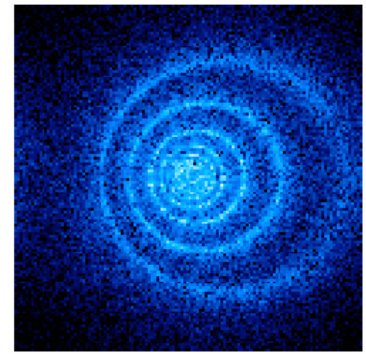


Ring Diagram Analysis & Sub-surface Synoptic Mapping



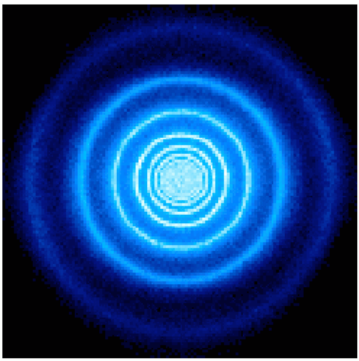
Primary operational goals:

Regular mapping of velocity fields from surface to depths $\sim 30\text{--}50$ Mm with spatial resolution ~ 100 Mm and temporal resolution ~ 1 d

Regular mapping of zonal-mean flows from surface to depths $\sim 50\text{--}100$ Mm with latitudinal resolution $\sim 5^\circ$ and temporal resolution 1 rot

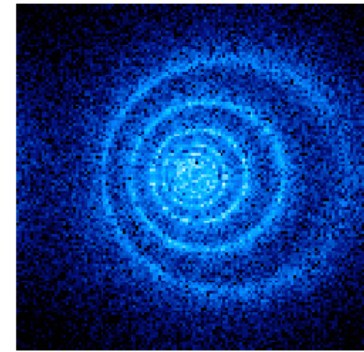
Research goals:

Study of near-surface kinematic, thermal and magnetic structures with spatial scales $\sim 10\text{--}100$ Mm and temporal scales $\sim 0.5\text{--}10$ d



Sub-surface synoptic flow mapping

Data Products



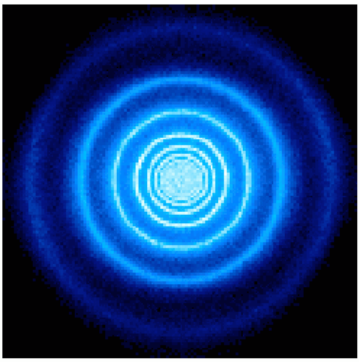
‘Dense-Pack’ tiles of tracked regions and their 3-d power spectra

MDI parameters:

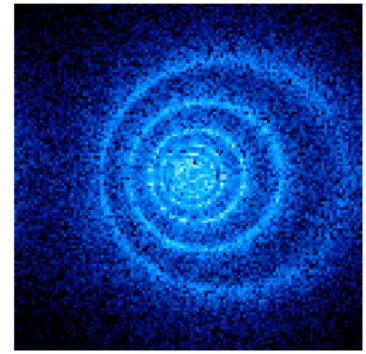
- spatial sampling: $0^\circ.125$ (1.5 Mm = 1" at disc center) to 60° from disc center: 189 regions
- temporal sampling: 1/24 CR \approx 1700 time steps of 60s
- ‘Daily’ data set \approx 15 GB (2/3 tracked cubes, 1/3 spectra)

HMI scaling: Increase by factor of ~ 30 (0.5 TB per ‘day’)

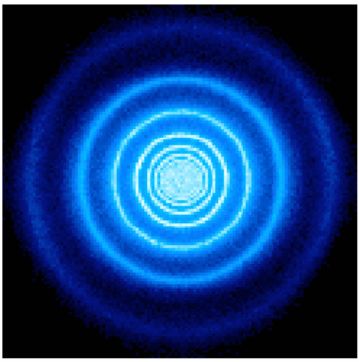
- increased spatial resolution
- tiling further to limb
- increased temporal resolution



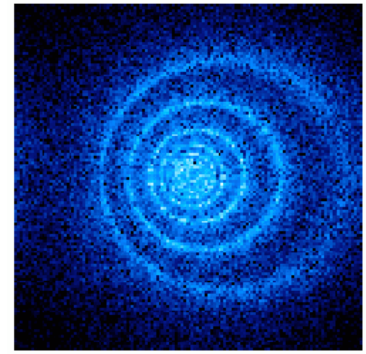
Key Issues



- defining appropriate geometry(ies), basis functions, sampling
- ‘leakage matrix’ corrections: curvature, foreshortening, spatial window
- improved fitting procedures
- building standard inversions into pipeline
- to track or not to track for zonal structure
- coordinating data products with time-distance requirements (e.g gap filling)



Challenges, Future directions



- Larger spatial windows for greater depth sensitivity
- Smaller spatial windows and/or substantial oversampling for greater spatial resolution
- Longer temporal windows for improved depth resolution
- Shorter temporal windows for better temporal resolution
- Use of additional observables (continuum intensity, line depth)
- Windowing/filtering for masking or tailored sensitivity