# Continuum Workshop

# Orléans 6-7 April 2004

## Whisper observations on board Cluster

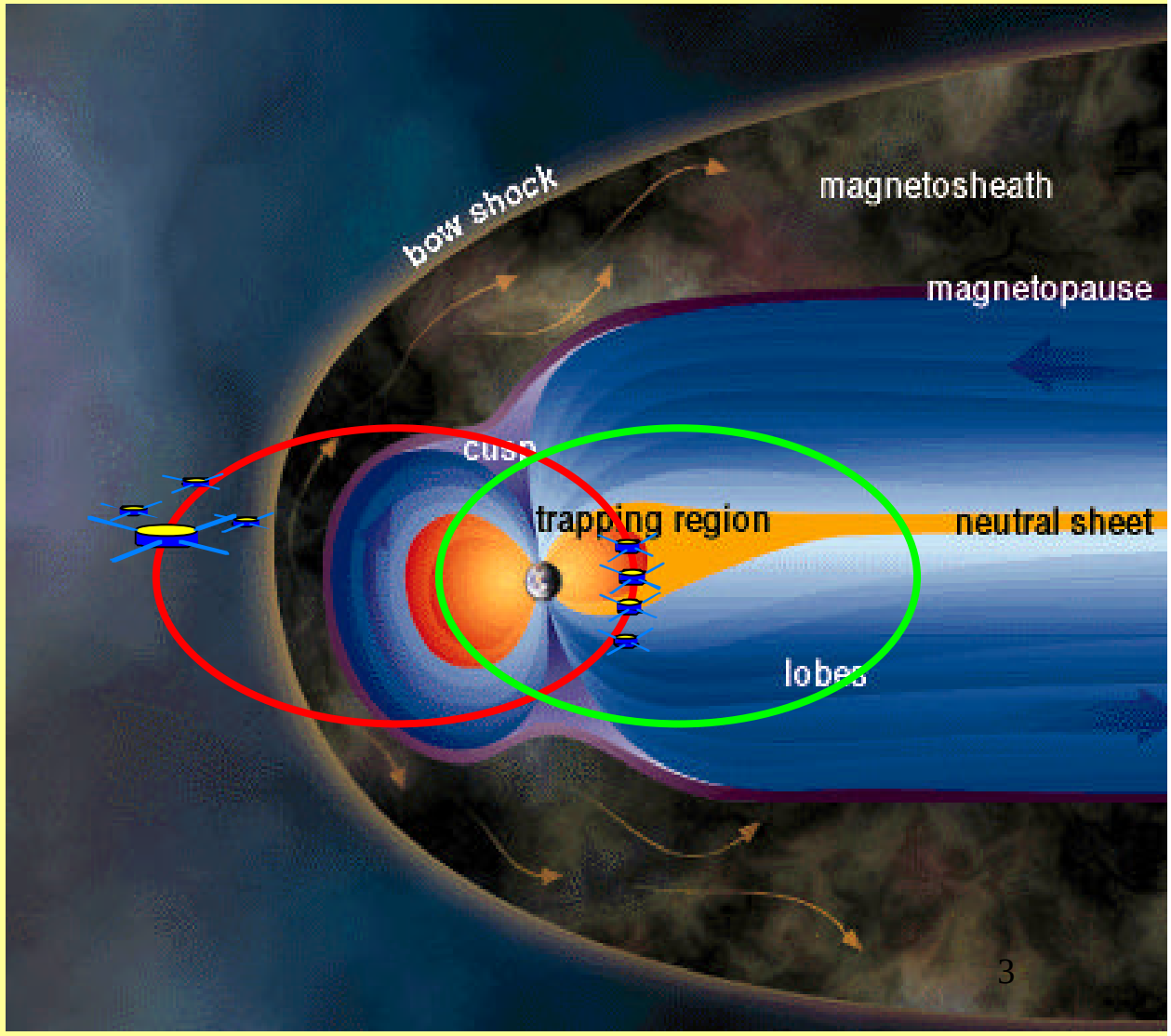
**Whisper team**

- Orbit and constellation configuration
- The Whisper instrument and techniques
- Gallery – according to regions

# Orbit and configuration (1)

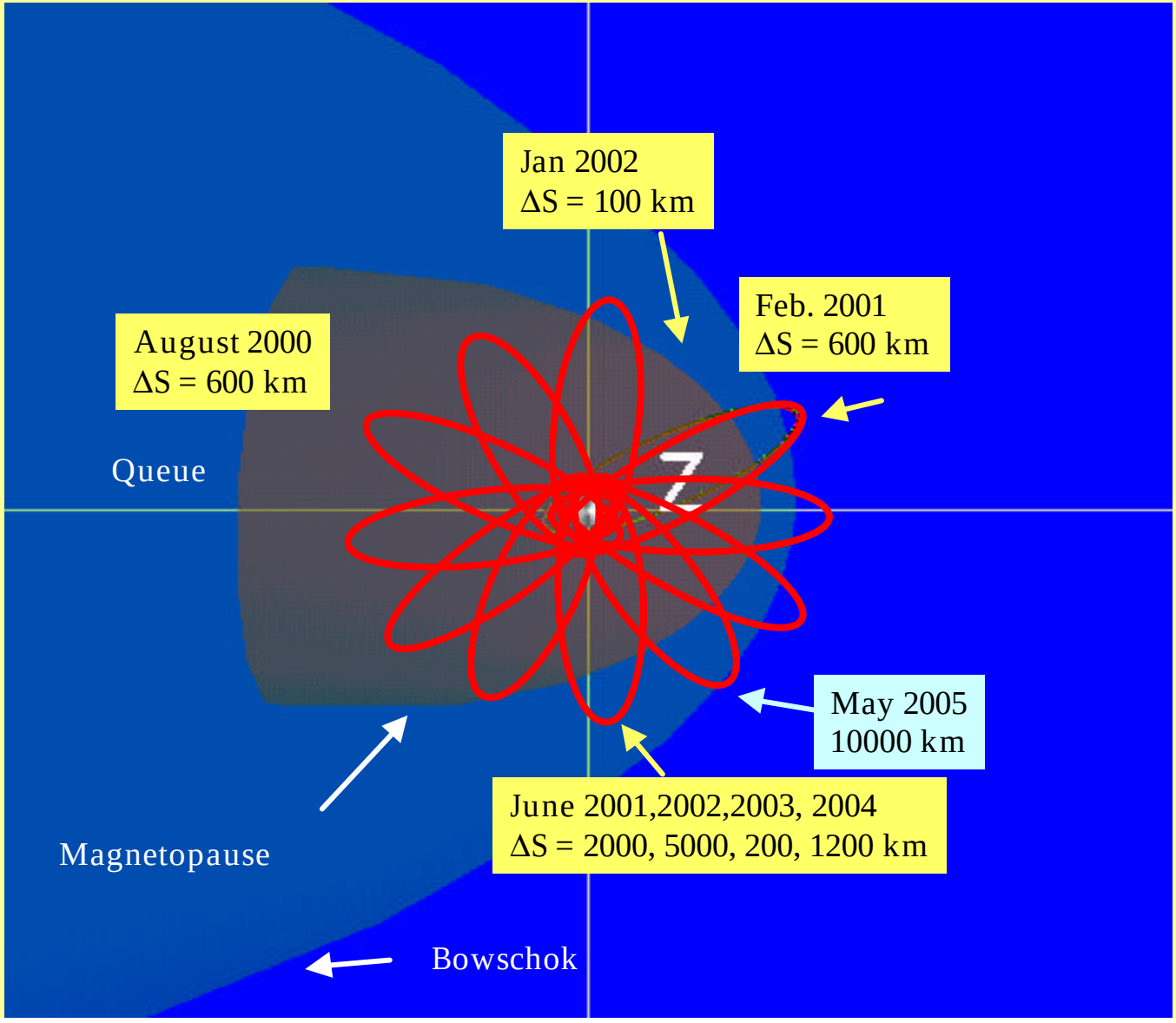
- Large portion of the orbit at high latitude
- all spin planes parallel to ecliptic
- ‘String of pearl’ near perigee (vicinity of NTC sources)

*Direction finding possible near apogee / perigee*



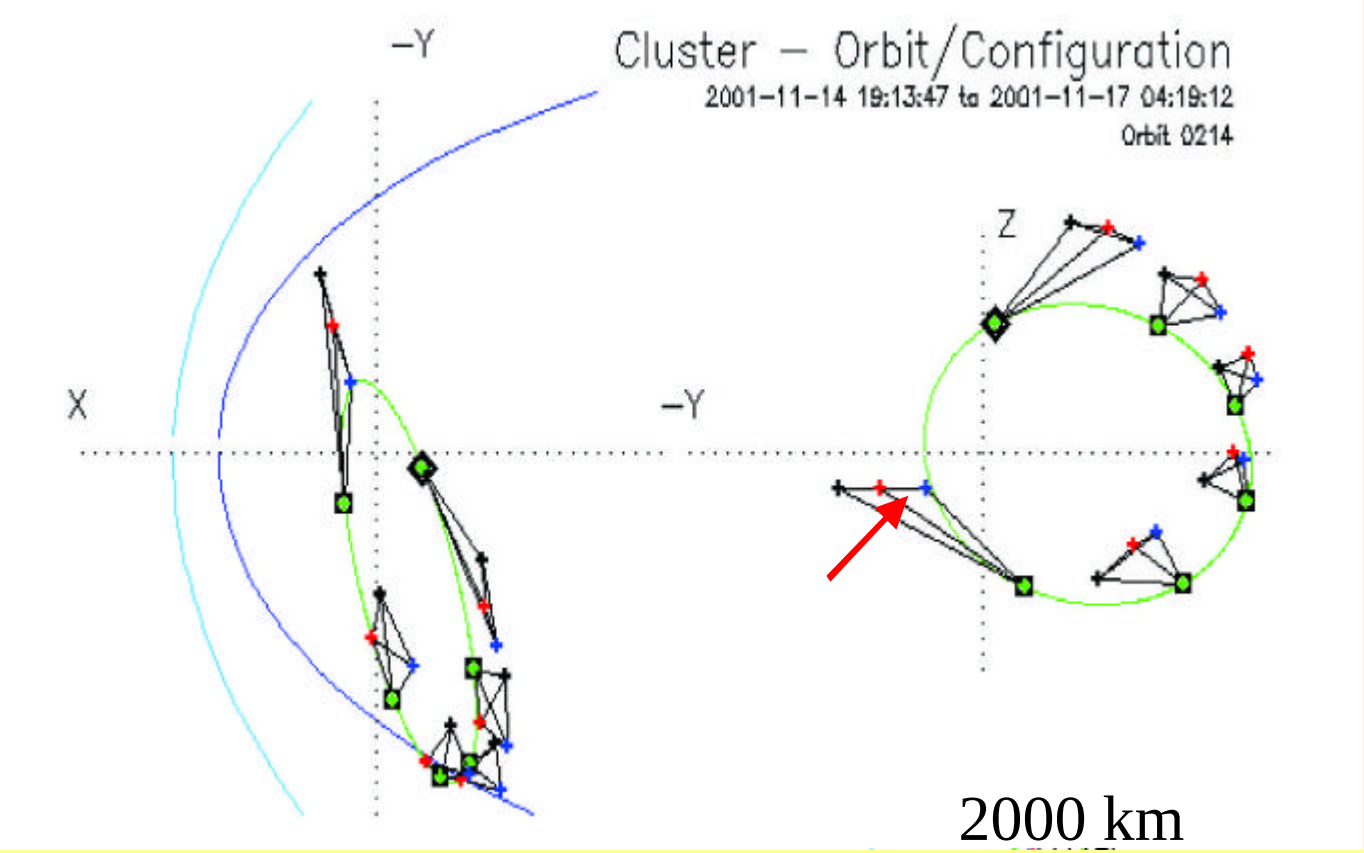
# Orbit and configuration (2)

## Separation strategy

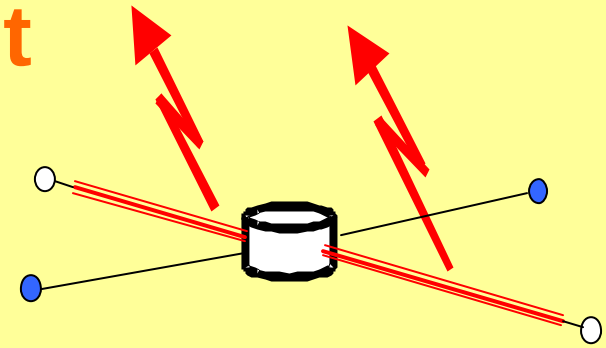


# Orbit and configuration (3)

The constellation configuration varies along orbit and according to separation step

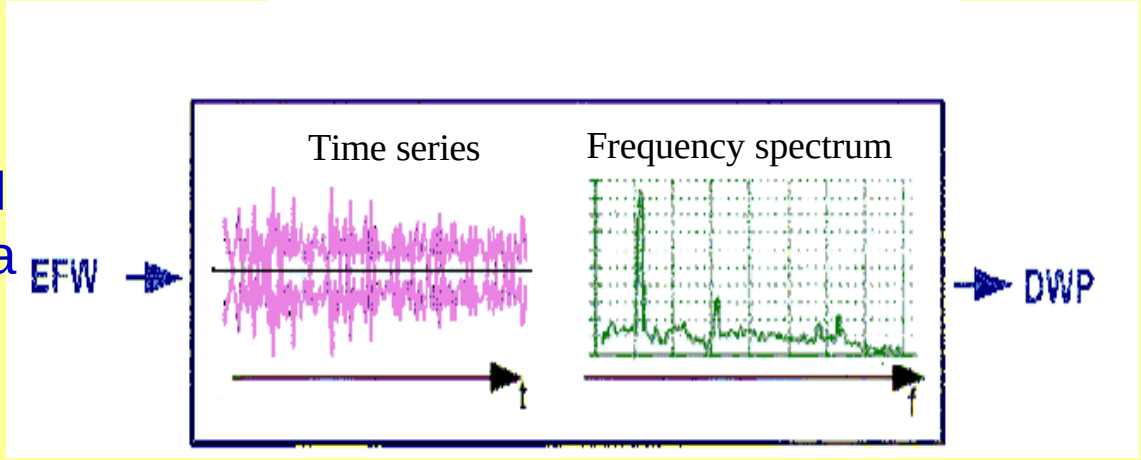


# The WHISPER instrument



## The wave analyser

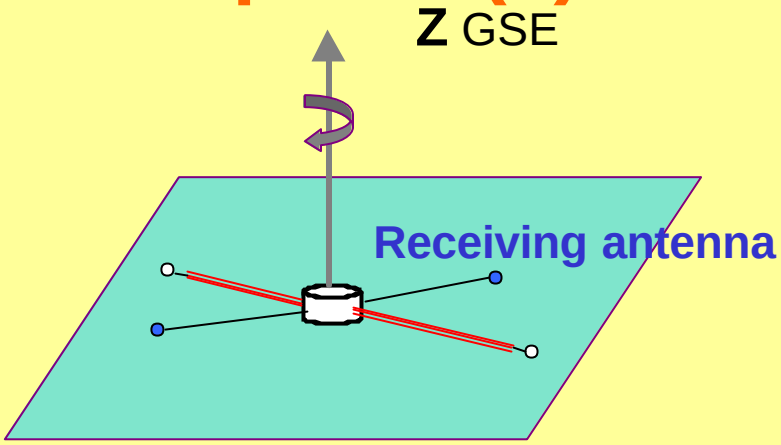
Sensors and antenna




On board compression

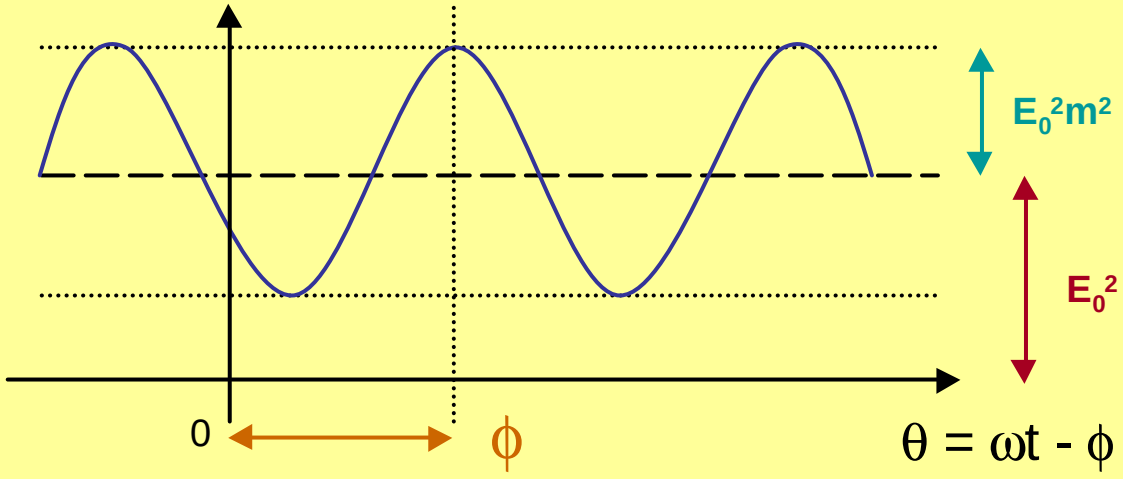
- Sensitivity : 2 $10^{-7}$ $V_{rms}$ Hz $^{-1/2}$
- Frequency range: 2 – 80 kz
- Best resolution: df = 160Hz, dt = 300 ms

# Direction finding in XY GSE plane (1)




- Assumption: free propagation, circular or random polarisation. Minimal signal for antenna aligned with projected wave vector

- Model: $E_m^2(t)=E_0^2\left(1+m^2\cos(2q)\right)$ with $\theta = \omega t - \phi$, antenna spin angle



# Direction finding (2)

- Method : minimize empirical variance (N samples)

$$S^2 = \sum_{i=1}^{N} \left[ E^2(t_i) - E_m^2(t_i) \right]^2$$

- Result : estimation of
  - maximum amplitude, $E_0$
  - modulation index, m
  - directivity angle, $a_k$