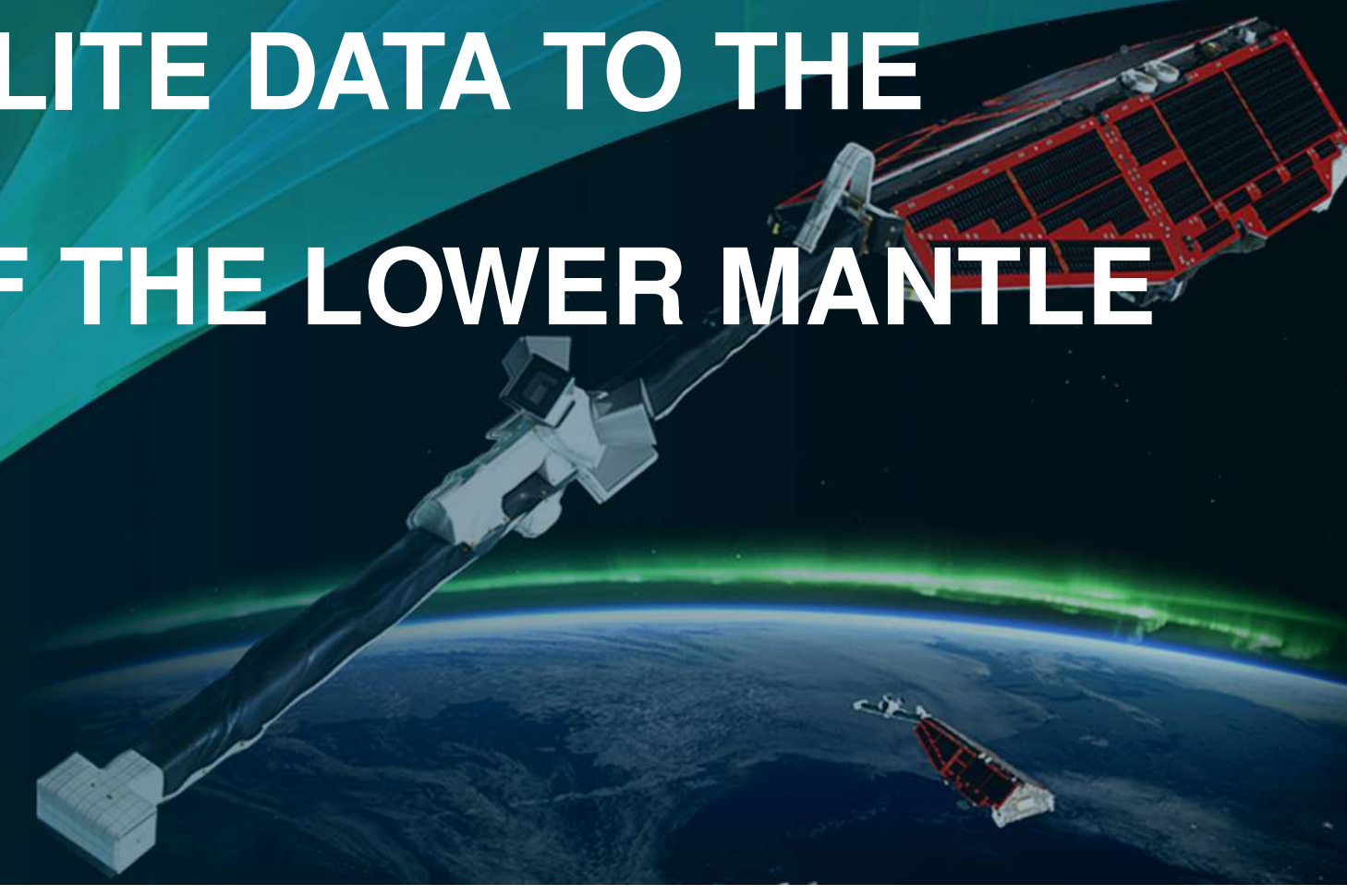




# SENSITIVITY OF SWARM SATELLITE DATA TO THE ELECTRICAL CONDUCTIVITY OF THE LOWER MANTLE

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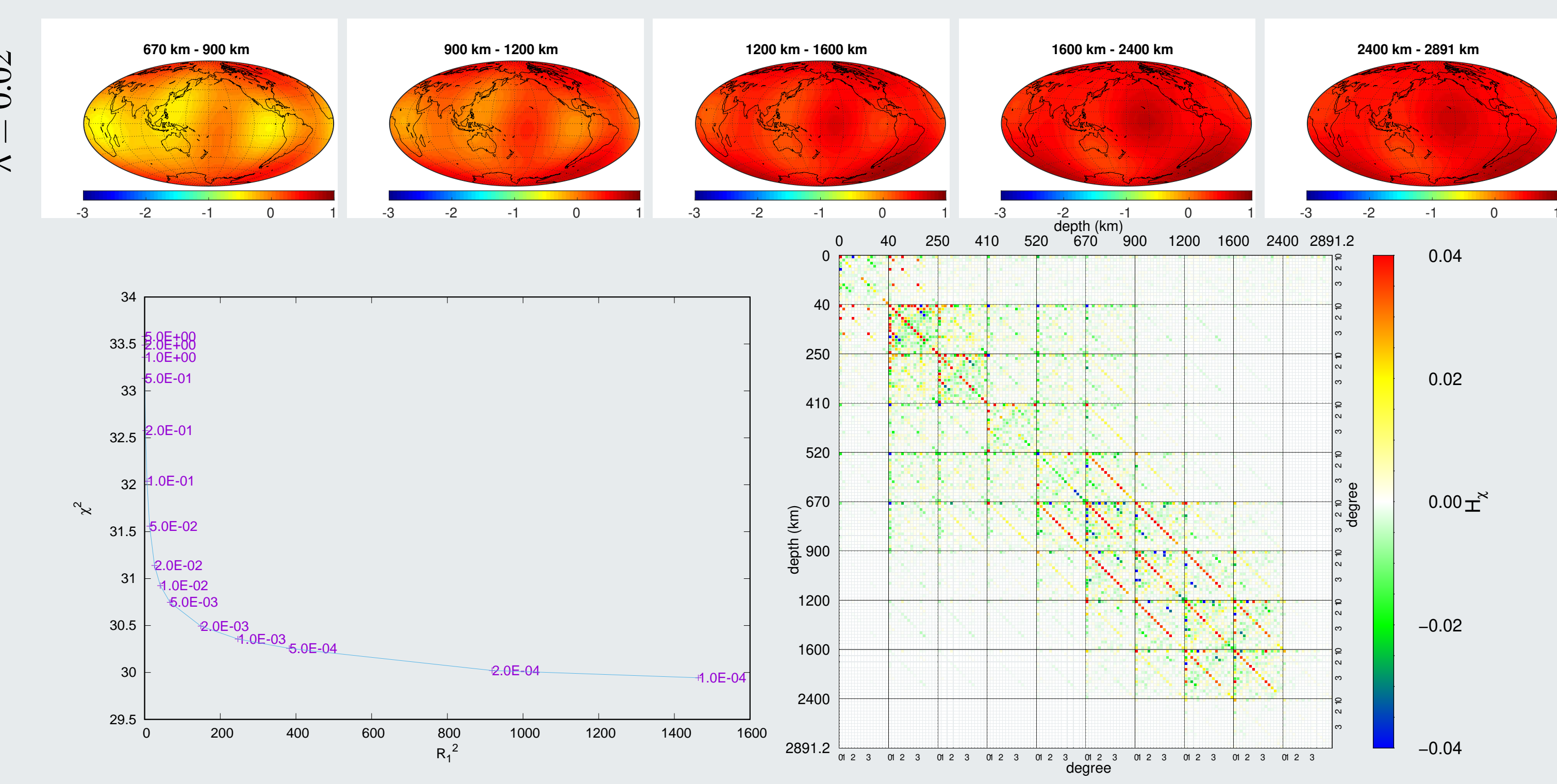


## COMPREHENSIVE APPROACH AFTER 10 YEARS

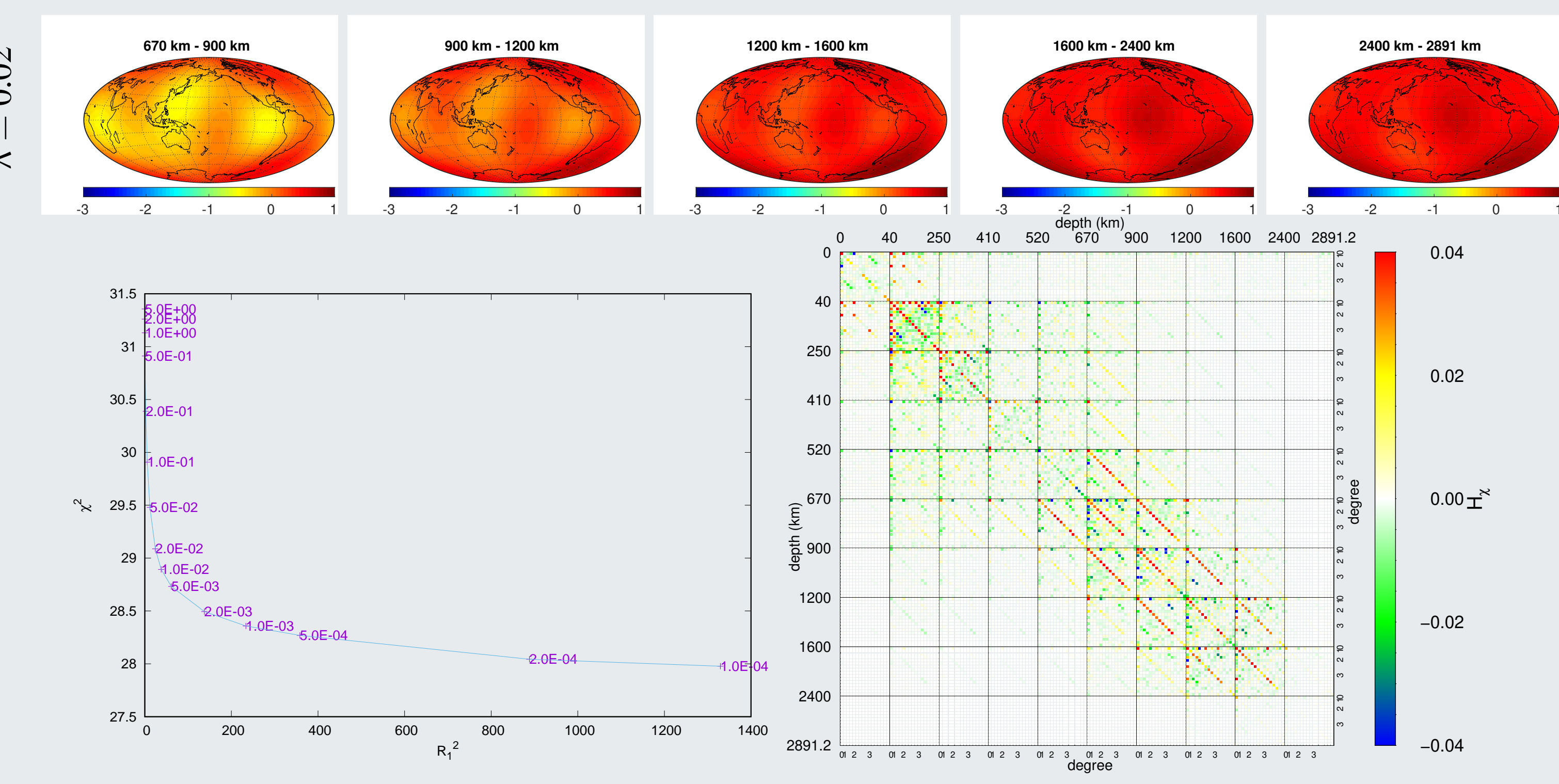
### SWARM DATA PROCESSING

- ▶ spherical harmonic coefficients of external and induced field
- ▶ removal of the main and ionospheric field model from track data
- ▶  $P_{10}$  coefficients sampled at 1.5 hrs, remaining at 6 hrs
- ▶ including covariance matrices
- ▶ 1001
  - ▶ external field recovered up to degree 3 and order 1
  - ▶ internal field recovered up to degree and order 3, plus  $(4, \pm 1)$  and  $(5, 0)$
  - ▶ high-dip-latitude damped by  $0.001 (\sin \vartheta)^2$
- ▶ 1002
  - ▶ same as 1001 with additional regularization of order 3 and degree  $\ell = 4$  internal field
- ▶ 1022a2
  - ▶ external and internal field recovered up to degree 3 and order 2
  - ▶ high-QD-latitude damped by  $0.001 \sin \vartheta$
- ▶ conductivity model includes the surface conductance map
- ▶ parameterization in 12 layers following the main mantle interfaces
- ▶ described by spherical harmonics up to degree and order 3
- ▶ regularization:  $\|\nabla_H \log \sigma\|^2$

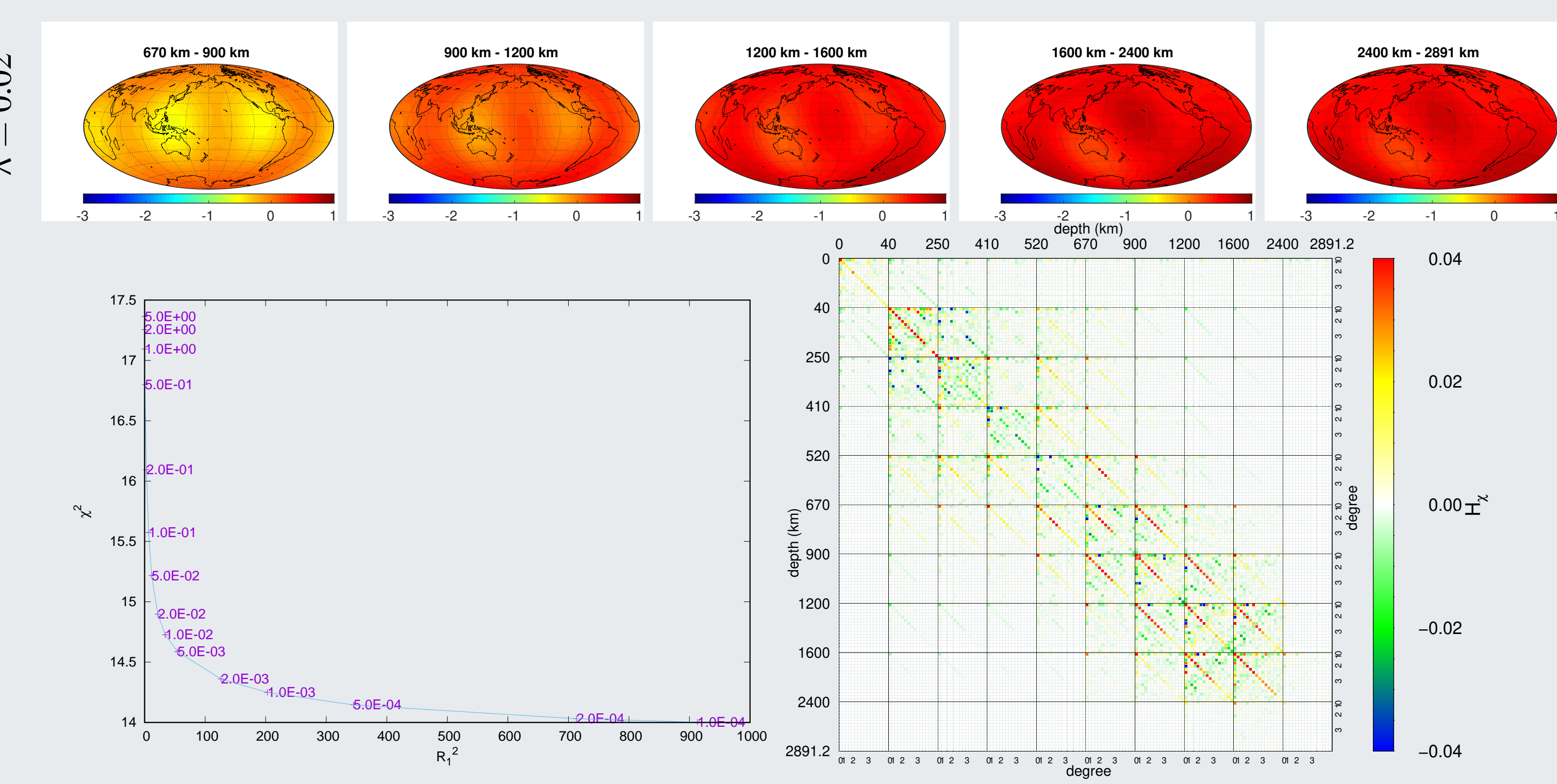
### 1001



### 1002

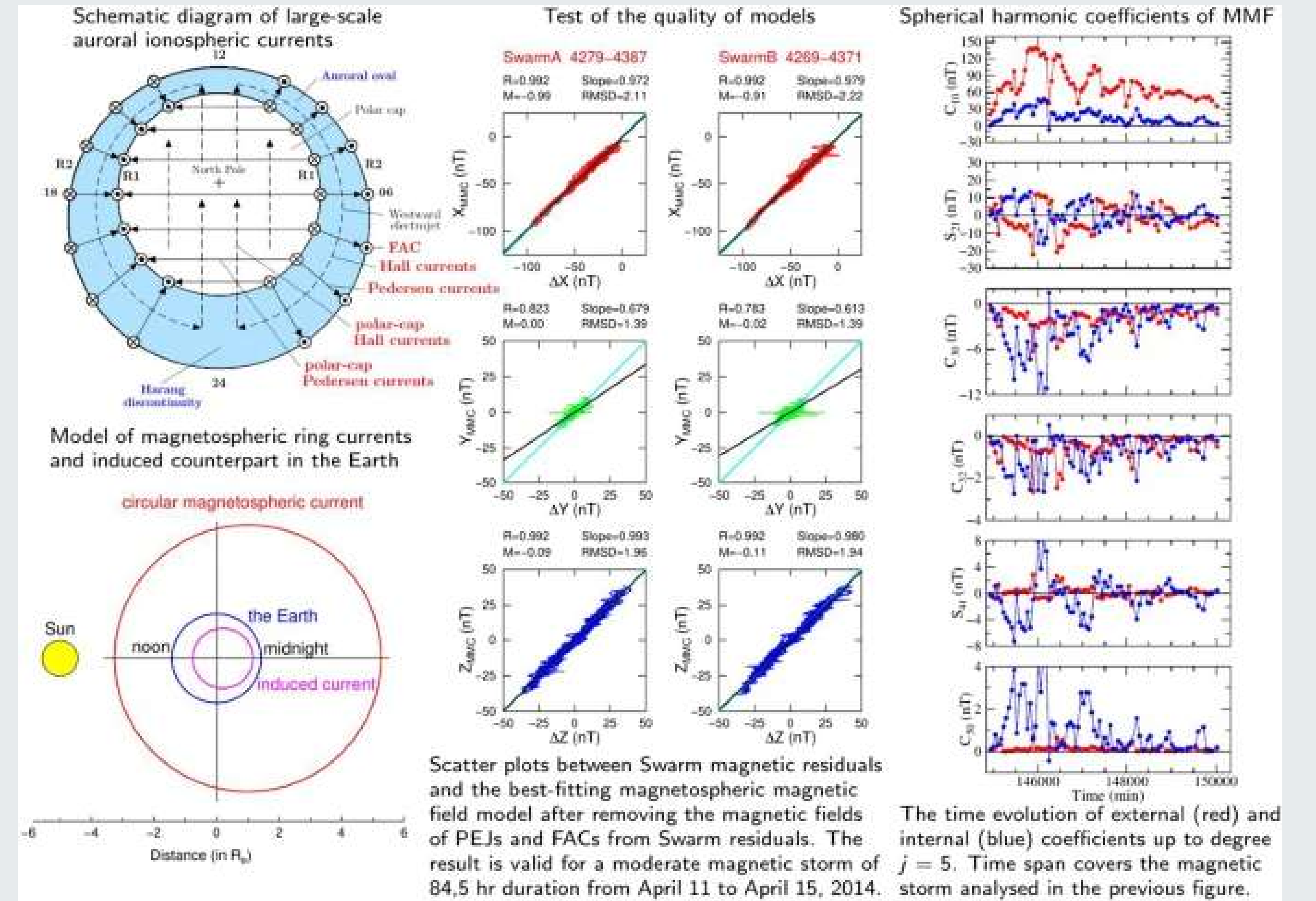


### 1022A2



## NEW APPROACH TO DATA PROCESSING

### ELECTRIC CIRCUIT MODEL OF PEJs AND FACs

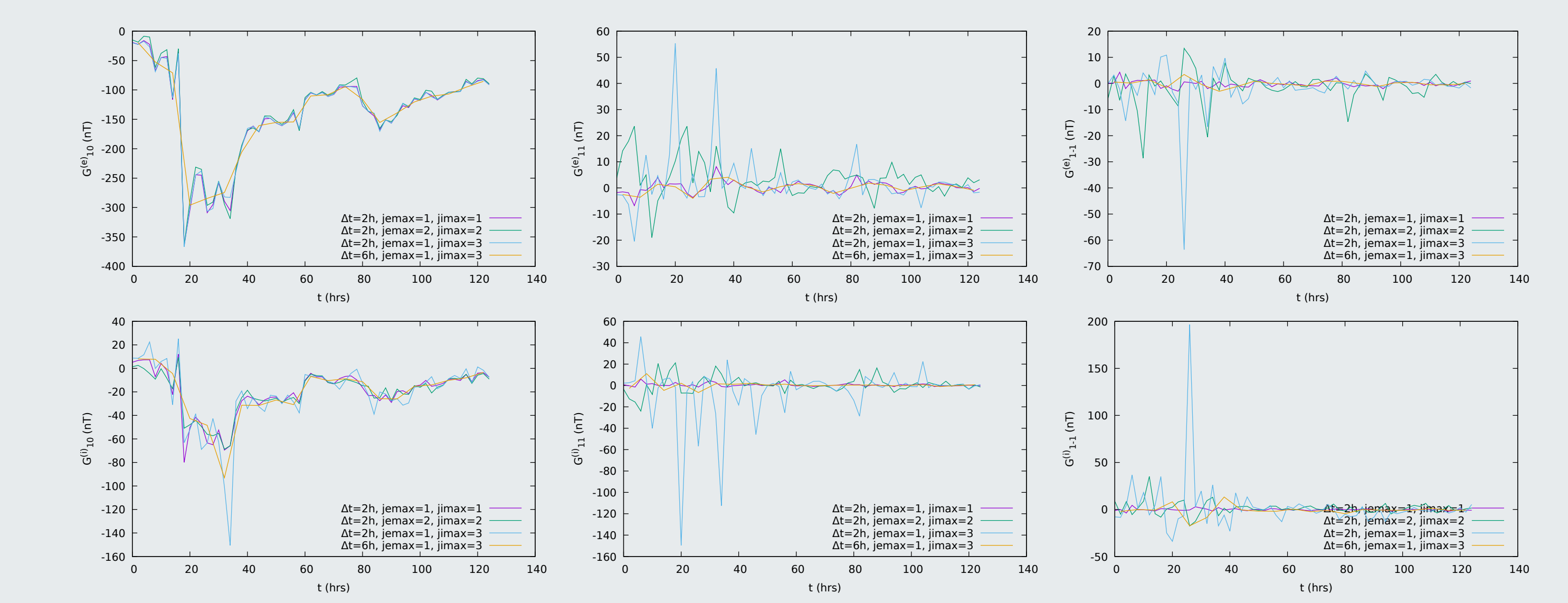


- + purely data driven correction applied for each satellite track
- + geometry optimized for PEJs and FACs structure
- subjective input from the scientist in the loop (position of auroral ovals)
- time-consuming processing of individual satellite tracks (single storm from 06/2015, A+B+C+CS2)

### PRELIMINARY INVERSION

- ▶ single geomagnetic storm from June 22–26, 2015
- ▶ Swarm A,B,C + CryoSat-2 along-track data
- ▶ night-side only
- ▶ removal of main, lithospheric, ionospheric, and M2 tidal field
- ▶ removal of PEJs and FACs
- ▶ two-hour bins
- ▶ external field up to degree/order 1/1
- ▶ internal field up to degree 3
- ▶ regularized inversion for log-conductivity in 11 layers up to degree/order 3/3

### TIME SERIES OF COEFFICIENTS



### RESULTS

