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GLOBAL HELIOSEISMOLOGY WORKING GROUP MEETING



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WP4.1 GLOBAL HELIOSEISMOLOGY:

Combine core competences of involved research groups and institutions to maximize the scientific exploitation of the existing helioseismic data archives from ground-based facilities and space missions.

WP4.1 GLOBAL HELIOSEISMOLOGY:

- Explore better ways to combine the Sun-as-a-star observations (e.g. GOLF, BISON and VIRGO) with the imaged ones (e.g. GONG, MDI or HMI) to have a good and homogeneous set of data for studying, for example, ionizations zones and to explore the Solar abundances problem.
- Explore new techniques to extract low-amplitude signals (p and g) modes by combining, in an efficient way, the contemporary information provided by all the instruments
- Develop new tools to extract global seismic parameters of HMI and AIA aboard the NASA mission SDO.
- To perform several hare-and-hound exercises to test all the methodology: from data analysis to modeling and inversions.

- To generate two novel solar magnetic activity proxies based on GOLF and VIRGO measurements using the luminosity variations and velocity perturbations induced by the active regions crossing the visible surface of the Sun.
- Compare the rising phases of solar Schwabe cycles 22, 23 and the current cycle 24, to uncover possible differences during this phase after the unusual behaviour of the Sun during the last magnetic-activity minimum.

Push forward the present barriers of our knowledge by developing more realistic structure and evolution models of the Sun as well as performing state-of-the-art 3D simulations to understand the physical mechanisms at the origin of the solar differential rotation and meridional flow.

List of deliverables

Deliverable Number ⁶¹	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature ⁶²	Dissemination level ⁶³	Delivery date ⁶⁴
D4.1	Report on GH working group meeting #1	3	1.00	R	PU	15
D4.2	Magnetic activity proxy of GOLF and VIRGO	2	6.00	O	PU	24
D4.3	Report on GH working group meeting #2	3	1.00	R	PU	27
D4.4	Tools to extract low frequency mode frequencies	3	14.00	O	PU	36
D4.5	Comparison of raising phase of activity cycles 22, 23, and 24	3	12.00	R	PU	36
D4.6	Statistical tools to combine the helioseismic instruments	3	14.00	O	PU	48
D4.7	Report on the 3D simulations of the Sun.	3	12.00	R	PU	48
D4.8	Web site providing access to simulated data	4	6.00	O	PU	12

➤ Simulated data

- SolarFLAG data
 - With and without solar activity effects
 - Any tools to build simulated data?
 - Time series or PSDs

➤ Tools to analyse low-frequency signals (low SNR)

- Simple fitting code available ?
 - Solar or Solar/stellar
 - Guesses?
 - MLE, MAP, Bayesian
 - Up to which l ?

➤ Analysis of Global modes from AIA and HMI

- Up to which l ?
- Comparison of the modes at different heights in the solar atmosphere
- What to deliver?
 - Paper / Report, A TOOL?

➤ Statistical tools to combine instrumentation

- Go beyond what it has been done
- What to deliver
 - Paper / Report, A TOOL?

- **Solar Activity proxy**
 - From the analysis of the time series
 - GOLF & VIRGO/SPM
 - Frequency of update
 - Other possible indexes:
 - Frequency shifts, Amplitude variations...
 - Up to which I

- **Comparison of cycle #24 with previous ones**
 - Group effort?
 - Paper as a deliverable (already a paper from BiSON group)

- **New workshop in a year from now**
 - Where?