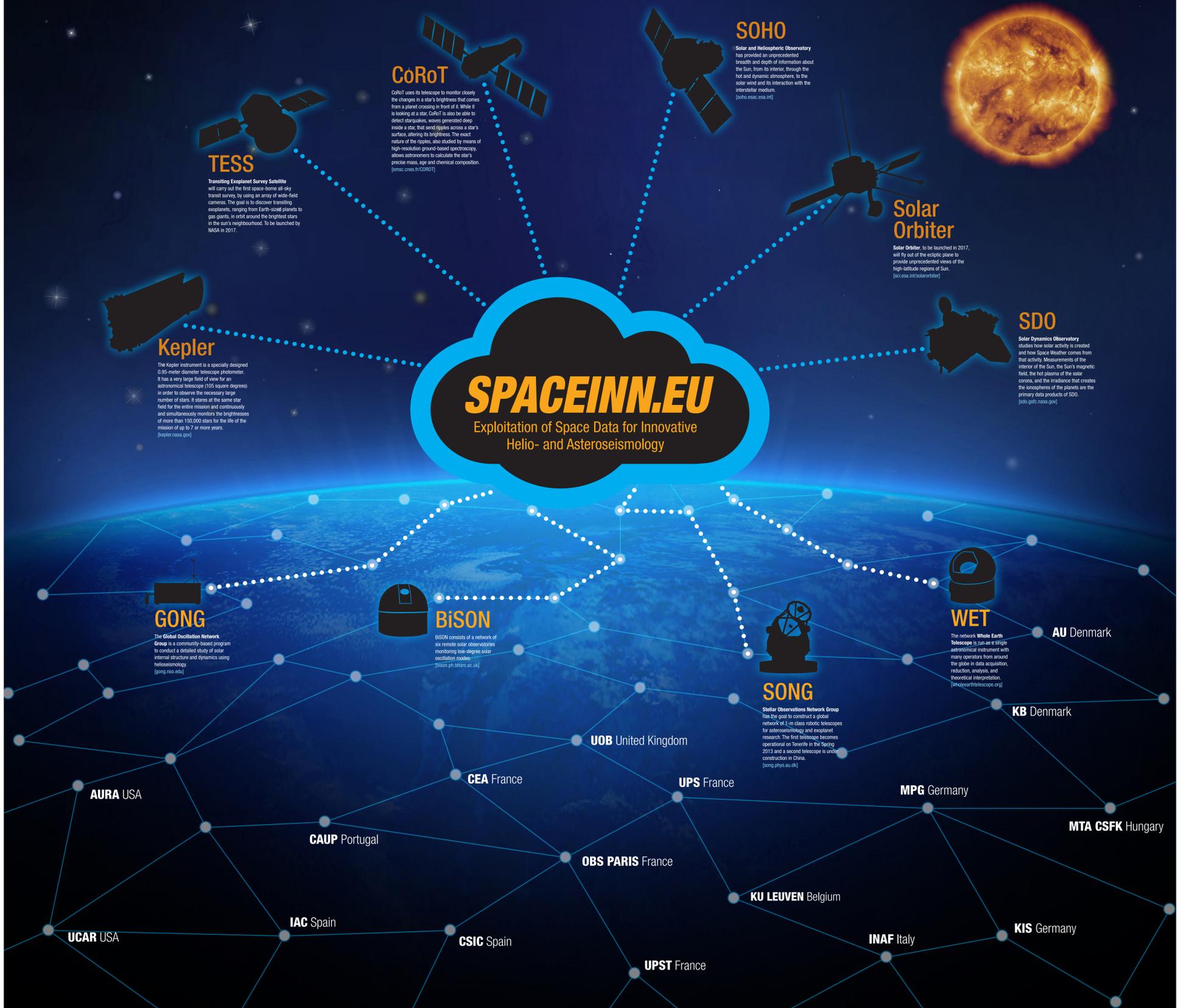# The main goal of SPACEINN is the full exploitation of space data and complementary ground-based data to allow for innovative approaches in helio- and asteroseismology.

SOHO
Solar and Heliospheric Observatory has provided an unprecedented breadth and depth of information about the Sun, from its interior, through the hot and dynamic atmosphere, to the solar wind and its interaction with the interstellar medium.
[soho.esac.esa.int]

CoRoT
CoRoT uses its telescope to monitor closely the changes in a star's brightness that comes from a planet crossing in front of it. While it is looking at a star, CoRoT is also be able to detect starquakes, waves generated deep inside a star, that send ripples across a star's surface, altering its brightness. The exact nature of the ripples, also studied by means of high-resolution ground-based spectroscopy, allows astronomers to calculate the star's precise mass, age and chemical composition.
[smsc.cnes.fr/COROT]

TESS
Transiting Exoplanet Survey Satellite will carry out the first space-borne all-sky transit survey, by using an array of wide-field cameras. The goal is to discover transiting exoplanets, ranging from Earth-sized planets to gas giants, in orbit around the brightest stars in the sun's neighbourhood. To be launched by NASA in 2017.

Solar Orbiter
Solar Orbiter, to be launched in 2017, will fly out of the ecliptic plane to provide unprecedented views of the high-latitude regions of Sun.
[sci.esa.int/solarorbiter]

Kepler
The Kepler instrument is a specially designed 0.95-meter diameter telescope photometer. It has a very large field of view for an astronomical telescope (105 square degrees) in order to observe the necessary large number of stars. It stares at the same star field for the entire mission and continuously and simultaneously monitors the brightnesses of more than 150,000 stars for the life of the mission of up to 7 or more years.
[kepler.nasa.gov]

SDO
Solar Dynamics Observatory studies how solar activity is created and how Space Weather comes from that activity. Measurements of the interior of the Sun, the Sun's magnetic field, the hot plasma of the solar corona, and the irradiance that creates the ionospheres of the planets are the primary data products of SDO.
[sdo.gsfc.nasa.gov]

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Exploitation of Space Data for Innovative Helio- and Asteroseismology

GONG
The **Global Oscillation Network Group** is a community-based program to conduct a detailed study of solar internal structure and dynamics using helioseismology.
[gong.nso.edu]

BiSON
BiSON consists of a network of six remote solar observatories monitoring low-degree solar oscillation modes.
[Bison.ph.bham.ac.uk]

SONG
Stellar Observations Network Group has the goal to construct a global network of 1-m class robotic telescopes for asteroseismology and exoplanet research. The first telescope becomes operational on Tenerife in the Spring 2013 and a second telescope is under construction in China.
[song.phys.au.dk]

WET
The network **Whole Earth Telescope** is run as a single astronomical instrument with many operators from around the globe in data acquisition, reduction, analysis, and theoretical interpretation.
[whole earthtelescope.org]

AU Denmark
KB Denmark
MPG Germany
MTA CSFK Hungary
KIS Germany
INAF Italy
KU LEUVEN Belgium
UPS France
OBS PARIS France
UPST France
CSIC Spain
IAC Spain
UCAR USA
CAUP Portugal
AURA USA
CEA France
UOB United Kingdom

SpaceInn.eu

Exploitation of Space Data for Innovative Helio- and Asteroseismology

With the organization of the large and increasing volume of space- and ground-based data, it will become possible to study in depth the interiors of the Sun and the stars. With this goal, the SPACEINN project will facilitate the cooperation through joint research between the major European groups working in this important field.

http://spaceinn.eu

To make optimal use of the large amounts of solar and stellar seismic data requires the best possible intellectual integration of scientists from helio- and asteroseismology, as well as from other related disciplines, to structure their research efficiently. The result will be a greatly improved understanding of the solar and stellar structure, evolution and activity, including also those aspects of the solar activity of potentially societal effects. These will require a major community effort to formulate precisely the scientific questions and the development of strategies for addressing and solving them.

The objective of this project is to build on the existing European strength in the field, in terms of data access, scientific expertise and existing coordination, and to secure optimal use of the existing and planned data, from space and from the ground, in helio- and asteroseismology. In this way we shall substantially strengthen the present activities and prepare for the future possibilities.

The outcome of the project will be:
– Coordinated archives of space- and ground-based data, as well as of the results of the analyses of these data. This will include tools for efficient data access, such as organization in a Virtual Observatory environment.
– Secured long-term preservation of these, often unique, data.
– Coordinated exploitation of the data, resulting in a much improved understanding of solar structure, dynamics and activity, as well as of stellar structure and evolution
– An increased awareness of the field, amongst the general public and at all levels of the educational system, throughout Europe.

Observations of oscillations on the solar and stellar surfaces are a unique and powerful tool to gain information on the physical processes in the Sun and stars.

Through helio- and asteroseismology we can obtain detailed inferences of the conditions inside the Sun, and extensive information on the properties of a broad range of stars (rotation, radii, masses and ages). Knowledge about the solar interior increases the understanding of structure and evolution for our central star. Also, it gives insight into the operation of the solar magnetic activity which has an important impact on our technological society through the potentially harmful solar eruptions, and which may play a significant role in space weather and the Earth's climate variations. The stellar results put the Sun into a broader context and provide an extensive possibility for testing and understanding the physical processes in stars. The resulting improvements in stellar characterization and modelling are crucial for broad areas of astrophysics, including the investigation of the structure and evolution of the Galaxy and the understanding of the formation of elements in the Universe.

Work-package Leaders

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Conny Aerts (WP5 – Asteroseismology)
Mario J. P. F. G. Monteiro (WP6 – Training, Outreach & Dissemination)

Project Partners

KIS Kiepenheuer-Institut für Sonnenphysik, Germany
IAC Instituto de Astrofísica de Canarias, Spain
CEA Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France
MPG Max-Planck-Gesellschaft zur Förderung der Wissenschaften, Germany
INAF Istituto Nazionale di Astrofisica, Italy
KU LEUVEN Katholieke Universiteit Leuven, Belgium
OBS PARIS Observatoire de Paris, France
CAUP Centro de Astrofísica da Universidade do Porto, Portugal
UOB University of Birmingham, United Kingdom
AU Aarhus Universitet, Denmark
UPS Université Paris-Sud / Institut d'Astrophysique Spatiale, France
CSIC Consejo Superior de Investigaciones Científicas / Instituto de Astrofísica de Andalucia, Spain
KB Det Kongelige Bibliotek – Nationalbibliotek og Københavns Universitetsbibliotek / Royal Library, Denmark
MTA CSFK Magyar Tudományos Akadémia Csillagászati és Földtudományi Kutatóközpont / Konkoly Observatory, Hungary
AURA National Solar Observatory, United States of America
UCAR High Altitude Observatory, United States of America
UPST Université Paul Sabatier Toulouse III, France