



St. Petersburg State University

Impact of energetic particles on the Earth atmosphere

Overview of activities (2011-2015) of WG3 COST ES1005 and the ISSI Team

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Pekka Verronen



and many our colleagues

The 7th Workshop on Solar Influences on the
Magnetosphere, Ionosphere and Atmosphere,
Bulgaria, 4 June 2015

ISSI Team project 2010-2012

<http://www.issibern.ch/teams/cosrayinf/>

Study of Cosmic Ray Influence upon Atmospheric Processes

The screenshot shows the ISSI website for the 'Study of Cosmic Ray Influence upon Atmospheric Processes' project. The header includes the ISSI logo and navigation links: 'Welcome', 'Meetings', 'Private', and 'Publications'. Below the header, the project title is displayed in a blue box. The main content area features a 'Welcome to our ISSI website' message and a 'Team members:' section. The team members are listed in two columns: 'Team members' and 'Young Scientists'. There is also an 'Invited expert:' section. A large image of the Earth from space is visible on the left side of the team list. At the bottom, there is a navigation menu with links: 'Home', 'Description', 'Participants', 'Research', 'Outreach', 'Activities', 'Downloads', and 'Contact'. Below the menu, there is a section titled 'COST Action ES1005' with a sub-header 'TOSCA - Towards a more complete assessment of the impact of solar variability on the Earth's climate'. The main content area is divided into 'What TOSCA is' and 'Latest news'. The 'What TOSCA is' section describes the project's goals and structure. The 'Latest news' section contains several news items with dates and brief descriptions. At the bottom, there are social media links for 'Learn more about TOSCA', 'Download TOSCA flyer', 'Learn more about COST', and 'Follow @GHOST_TOSCA'.

INTERNATIONAL SPACE SCIENCE INSTITUTE
Welcome Meetings Private Publications

STUDY OF COSMIC RAY INFLUENCE UPON ATMOSPHERIC PROCESSES

Welcome to our ISSI website

Team members:

- Karen L. Aplin (GB)
- Frank Arnold (DE)
- Galina A. Bazilevskaya (RU)
- Giles R. Harrison (GB)
- Alexei Krivolutsky (RU)
- Markku Kulmala (FI)
- Irina A. Mironova (RU)
- Eugene Rozanov (CH)
- Peter Thejll (DK)
- Esa Turunen (SE)

Young Scientists:

- Ilona Riipinen (FI)
- Keri Nicoll (GB)
- Julien Gerard Anet (CH)

Invited expert:

- Miikka Dal Maso (FI)

Home Description Participants Research Outreach Activities Downloads Contact

COST Action ES1005
TOSCA - Towards a more complete assessment of the impact of solar variability on the Earth's climate

What TOSCA is

TOSCA is a multidisciplinary European network of scientists from more than 18 countries whose objective is to provide a better understanding of the hotly debated role of the Sun in climate change. This action aims at assessing the various contributions of solar variability to the Earth's climate by bringing together solar physicists, space scientists, atmospheric scientists, climate modellers, paleoclimatologists, and more.

TOSCA started in June 2011 and will last for 4 years. As for other COST (Cooperation in Science and Technology) actions, the main role of TOSCA is to foster interactions between different communities.

TOSCA has 5 working groups

- WG1 Impact of solar radiative forcing
- WG2 Impact of interplanetary perturbations
- WG3 Impact of energetic particles
- WG4 Interfacing between upper and lower atmospheric layers and corresponding models
- WG5 outreach and dissemination (GHOST)

Latest news

- [11/8/2013] registration for science meeting in Prague (30 Sept-4 Oct) now open at <http://www.issibern.ch/tosca/>
- [9/20/2013] Our next training school will be held at CTR (France) from 15-17 October 2014 (not 2013).
- [11/6/2013] The next call for STSMs closes on September 7, 2013. [More information](#)
- [30/4/2013] Next TOSCA science meeting in Prague, 30 Sept - 4 Oct
- [18/2/2013] The next call for STSMs closes on June 7, 2013. [More information](#)
- [12/4/2013] successful TOSCA sessions at the EGU. Special issue is planned in SWSC. Deadline for decoration of interest is May 15.
- [16/3/2013] the school in Thessaloniki is over! A great event.

Learn more about TOSCA
Download TOSCA flyer
Learn more about COST
Follow @GHOST_TOSCA

ISSI Team project 2013-2015

<http://www.issibern.ch/teams/ionizationsources/>

Specification of Ionization Sources Affecting Atmospheric Processes

The screenshot shows the ISSI website for the 'Specification of Ionization Sources Affecting Atmospheric Processes' project. The header includes the ISSI logo and navigation links: 'Welcome', 'Meetings', 'Private', and 'Publications'. Below the header, the project title is displayed in a blue box. The main content area features a 'Welcome to our ISSI website' message and a 'Team members:' section. The team members are listed in two columns: 'Team members' and 'Young Scientists'. There is also an 'Invited expert:' section. A large image of the Earth from space is visible on the left side of the team list. At the bottom, there is a paragraph describing the project's goals and objectives. The text states: 'As the main result of the Project, we aim at increasing and synthesizing understanding of the ionization sources in the Earth atmosphere, in particular the parameterization of the ionization rates by energetic particles of different ranges of energies. Accordingly, we expect that the effect can be implicitly included into modern state-of-the-art climate models leading to a breakthrough in the level of modeling of natural variability of climate.'

INTERNATIONAL SPACE SCIENCE INSTITUTE
Welcome Meetings Private Publications

Specification of Ionization Sources affecting Atmospheric Processes

Welcome to our ISSI website

Team members:

- Karen L. Aplin (GB)
- Galina A. Bazilevskaya (RU)
- Bernd Funke (ES)
- Giles R. Harrison (GB)
- Alexei Krivolutsky (RU)
- Vladimir Makhmutov (RU)
- Irina A. Mironova (RU)
- Keri Nicoll (GB)
- Eugene V. Rozanov (CH)
- Miriam Sinnhuber (DE)
- Ilya G. Usoskin (FI)
- Jan Maik Wissing (DE)

Young Scientists:

- Olesya Yakovchouk (RU)
- Anton Artamonov (FI)

Invited expert:

- Frank Arnold (DE)

As the main result of the Project, we aim at increasing and synthesizing understanding of the ionization sources in the Earth atmosphere, in particular the parameterization of the ionization rates by energetic particles of different ranges of energies. Accordingly, we expect that the effect can be implicitly included into modern state-of-the-art climate models leading to a breakthrough in the level of modeling of natural variability of climate.

COST Action ES1005 (2011-2015)

<http://lpc2e.cnrs-orleans.fr/~ddwit/TOSCA/Home.html>

TOSCA - Towards a more complete assessment of the impact of solar variability on the Earth's climate
Particularly WG3 (impact of energetic particles)

Future reading

Invited Review Manuscript
in **Space Science Review Journal**
accepted in 2015

Energetic particle influence on the Earth's atmosphere

Irina A. Mironova · Karen L. Aplin · Frank Arnold · Galina A. Bazilevskaya
· R. Giles Harrison · Alexei A. Krivolutsky · Keri A. Nicoll · Eugene V. Rozanov
· Esa Turunen · Ilya G. Usoskin

Energetic particle influence on the Earth's atmosphere

Irina A. Mironova et al., Space Sci. Rev. , accepted 2015

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Future reading



Reviewed Journals:

Calisto M., **I. Usoskin**, **E. Rozanov**, and T. Peter,
Influence of Galactic Cosmic Rays on atmospheric composition and dynamics,
Atmos. Chem. Phys., 11, 4547–4556, doi:10.5194/acp-11-4547-2011, 2011

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Future collaboration

Project ROSMIC

(Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate)

<http://varsiti.org/> (part of VarSITI project 2014-2018)