ABC News

Spectacular images from Sun probe

By Stuart Gary for ABC Science Online

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Scientists are seeing the violent and dynamic processes of the Sun in unprecedented detail thanks to a new spacecraft launched by the United States.

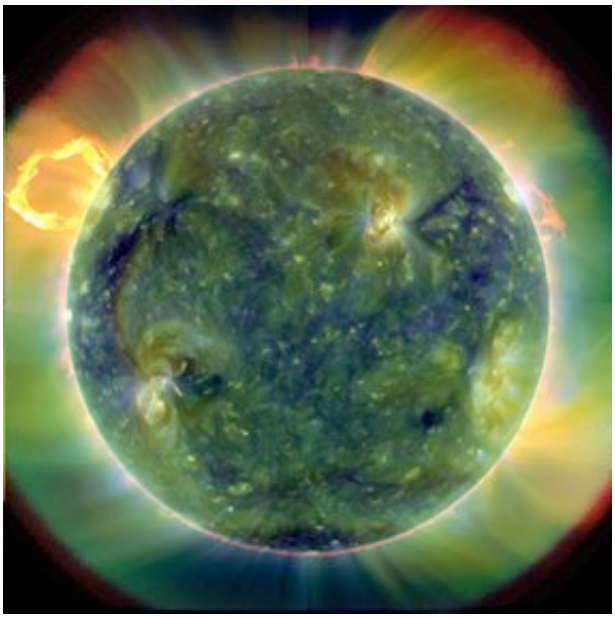
The "first light" data from NASA's Solar Dynamics Observatory (SDO) is providing extreme close-ups of the Sun's surface, including never-before-seen detail of material streaming outward and away from sunspots.

Scientists with NASA's Goddard Space Flight Centre say SDO will change their understanding of the Sun and its processes, having an impact similar to what the Hubble Space Telescope did for modern astrophysics.

Launched on February 11, SDO is the most advanced spacecraft ever designed to study the Sun.

"It's a powerful new tool to help scientists understand solar activity like coronal mass ejections and solar flares which can have a huge impact for life on Earth," said Professor Iver Cairns from the School of Physics at the University of Sydney.

"SDO will provide critical data to improve sciences ability to predict space weather events."



A false-colour image of the Sun taken by the Solar Dynamics Observatory. (Goddard Space Flight Centre NASA)

- ***Video:** NASA unveils solar images (7pm TV News NSW)*

Professor Cairns says understanding space weather is important because of its impact on communications systems, spacecraft electronics and power supplies on the ground.

"In 1987 a blackout in Quebec, Canada caused by a solar storm left 4 million people without power, some for up to six months," he said.

Dr Steven Marsden, a stellar astronomer with the Anglo Australian Observatory, says the resolution of images from SDO is the best he has ever seen.

"It will us help study the Sun's magnetic activity, which is driven by an internal dynamo and a combination of heat convection and differential rotation," he said.

"While we have an understanding of this process, we still don't understand a lot of the finer details of how it operates."

Climate change

Dr Marsden says SDO will also help scientists understand the relationship between sunspot activity and climate

change on Earth.

"During a period called the Maunder Minimum (1645-1715), sunspot activity almost completely disappeared. It coincided with a mini-ice age when the Thames River froze and there were colder than usual conditions across Europe," he said.

SDO carries a Helioseismic and Magnetic Imager which maps solar magnetic fields. It can also look beneath the Sun's opaque surface using ultrasound.

Another key instrument is the Atmospheric Imaging Assembly, a group of four telescopes which will study the Sun's surface and atmosphere in 10 different wavelength bands.

"Because it operates at different wavelengths ... SDO will help us understand what's going on inside the Sun's dynamo," Dr Marsden said.

The third major component is the Extreme Ultraviolet Variability Experiment which measures fluctuations in the Sun's radiant emissions.

These emissions have a direct effect on Earth's upper atmosphere.

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