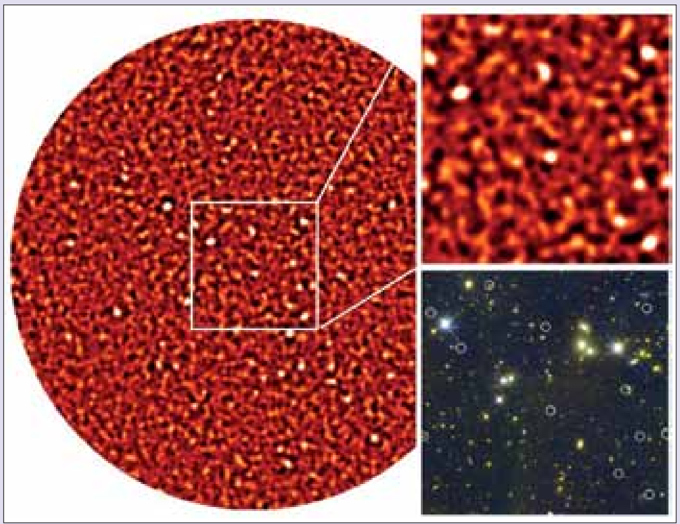
SCUBA-2 shows its mettle



This is a 450µm image of a 15arcminute-diameter region within the COSMOS field taken with the new SCUBA-2 submillimetre camera on the James Clerk Maxwell Telescope (JCMT), Hawaii. These are the deepest panoramic observations ever obtained at 450µm – from a ground-based telescope – and the combination of the impressive sensitivity of SCUBA-2 and the fine resolution provided by the large aperture of the JCMT means that they reach below the detection limit of similar observations from ESA's Herschel Space Observatory. The detailed panels show an enlarged region of the field and compare this to a "true-colour" image constructed from the recent Hubble Space Telescope WFC3 optical and near-infrared observations of this field from the CANDELS project. This demonstrates that SCUBA-2 450µm sources exhibit a wide variety of optical/near-infrared properties and include some sources which are undetected even in this extremely deep optical/near-infrared imaging. These are likely to be the highest redshift and dustiest submillimetre sources. These data were taken as part of the SCUBA-2 Cosmology Legacy Survey. (Dr J E Geach [McGill] and the tri-national S2CLS Consortium)

Exoplanet hit by stellar flare – loses atmosphere

A dramatic demonstration of the effects of a flare from a star on the atmosphere of a closely orbiting gas giant exoplanet has come from combining data from the Hubble Space Telescope and NASA'a Swift gamma-ray observatory.

Artist's impression of a flare driving off the atmosphere. (NASA/ESA/HST)

The exoplanet is HD 189733b, a gas giant like Jupiter, but about 14% larger and more massive. The planet circles its star, HD 189733A at a distance of only 5 million km and completes an orbit every 2.2 days. HST data had previously shown that the exoplanet was losing significant amounts of hydrogen from its upper atmosphere – it was called an "evaporating" exoplanet.

A team led by Alain Lecavelier des Etangs at the Paris Institute of Astrophysics (IAP), part of the French National Scientific Research Center located at Pierre and Marie Curie University in Paris, took a closer look. Observations using the HST's Imaging Spectrograph (STIS) during a transit in April 2010 revealed no trace of the planet's atmosphere, but follow-up STIS observations in September 2011 showed a surprising reversal, with striking evidence that a plume of gas was streaming away from the exoplanet. At least 1000 tonnes of gas was leaving the planet's atmosphere every second, with hydrogen atoms racing away at speeds more that 500 000 km/hour.

Because X-rays and extreme ultraviolet starlight heat the planet's atmosphere and are likely to drive its escape, the team also monitored the star with the X-ray Telescope on Swift. On 7 September 2011, just eight hours before Hubble was scheduled to observe the transit, Swift saw a powerful flare. The star brightened by 3.6 times in X-rays, a spike that came on top of normal emission levels already greater than those of the Sun.

"The planet's close proximity to the star means it was struck by a blast of X-rays tens of thousands of times stronger than the Earth suffers even during an X-class solar flare, the strongest category," said co-author Peter Wheatley, a physicist at the University of Warwick in England.

http://www.nasa.gov/swift
http://www.nasa.gov/hubble

Supercomputing to serve weather forecasting

The Science and Technology Facilities Council (STFC), the Met Office and the Natural Environment Research Council (NERC) are together designing and building a next-generation weather forecasting model that will exploit ultra-fast supercomputers and boost the effectiveness of forecasts. The goal is to save money – and lives.

The new model will benefit from using exascale supercomputers, thousands of times faster than today's systems. It will use the High Performance Supercomputing facility at STFC's Daresbury Laboratory in Cheshire. It is anticipated that the new code will, in time, replace the dynamical core of the Met Office's Unified Model (UM), the principal UK tool for weather and climate prediction, also used by national weather services around the world.

Prof. Stephen Mobbs, Director of NERC's National Centre for Atmospheric Science, said: "Tomorrow's exascale computers represent a huge opportunity and a huge challenge for the science of weather forecasting. The opportunity to produce forecast detail down to the scales which affect specific human activities are beckoning. At the same time, the computer software challenges of effectively using millions of processors open up new areas of computer science."

Associate Director of STFC's Computational Science and Engineering Department Dr Mike Ashworth said: "There are many challenges to overcome, the main issue being that the models used to simulate the atmosphere today would be unable to take advantage of the processing power of the ultra-fast computers available within the next few years. We are working together to design and develop a next-generation computer program that will do the key job of simulating the winds, temperature and pressure. This, when combined with other processes such as cloud formation, will allow us to simulate the changing weather conditions."

http://bit.ly/MxGKFW

South Pole detectors will predict solar proton events

Energetic particles from the Sun are a known hazard to astronauts and passengers and crew of high-altitude aircraft on polar flight-paths. Now researchers plan to predict such events using neutron detectors at Earth's South Pole.

Solar proton events are one type of space weather, fluctuations in the Sun's output that affect people and technology on and around Earth. Mitigating the effects of space weather requires forecasting, which has proved difficult. Now a team of South Korean and US researchers has found that measuring the energy spectrum of GeV neutrons at the South Pole gives a good guide to the slower and damaging MeV protons that follow. They tested their system on 12 solar events in the past, and found a good agreement with satellite data. The method gives a typical warning time of 166 minutes.

S Y Oh of Dept of Astronomy and Space Science, Chungnam National University, South Korea and of Bartol Research Institute, Dept of Physics and Astronomy, University of Delaware and co-workers published their method in *Space Weather.*

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