RAL
DESIGN & DISCOVERY
Open Days July 1990
RUTHERFORD APPLETON LABORATORY
SCIENCE AND ENGINEERING RESEARCH COUNCIL

Cambridge Set To Monitor Interplanetary Clouds

With the refurbishment of an 81.5 MHz radio telescope at Cambridge scientists will be able to track the passage of material ejected from the Sun as it travels through interplanetary space. It is hoped that the antenna will operate for at least 10 years, during which time the observations will be invaluable for determining how and why the Sun ejects matter into space and for predicting the effects of such events when they reach the Earth.

Our understanding of the influence of solar activity on the Earth is very poor. We know that the Sun ejects large quantities of matter into space in the form of the so called solar wind and in individual events where huge quantities of matter are expelled at once.

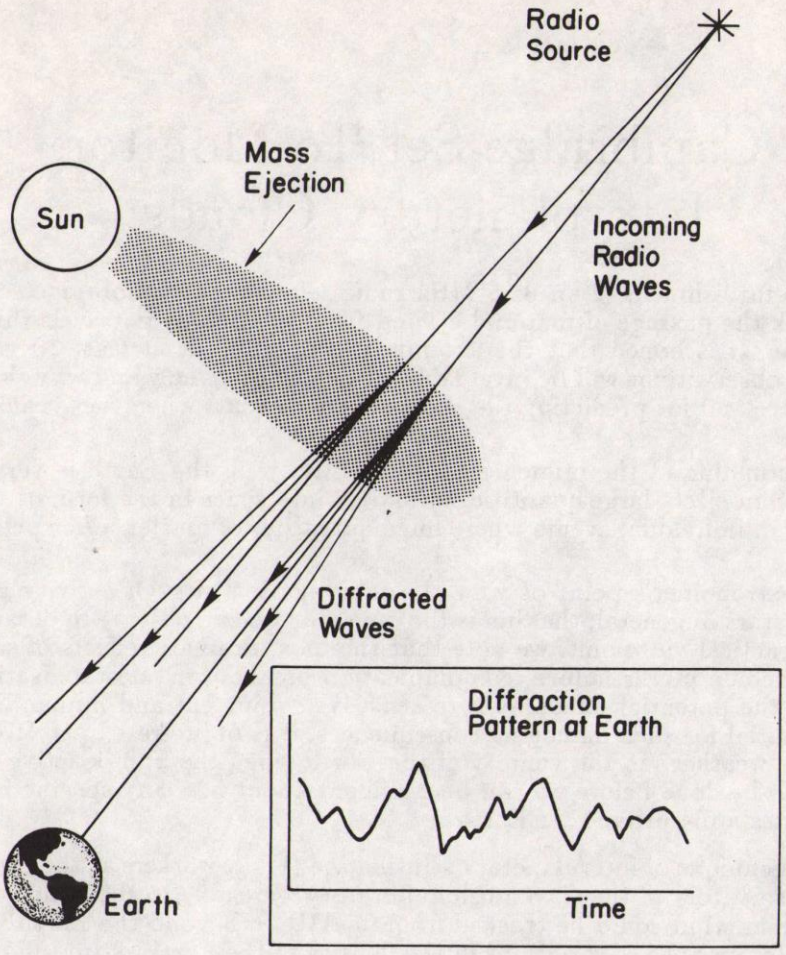
From the astronomer's point of view the investigation of such activity is critical to understanding stars in general; the Sun is the only star we can observe in detail. However, from a more practical viewpoint, we note that the most dramatic effects of solar activity at the Earth include power failure, communication breakdowns, destabilisation of satellite orbits and the potential for damage to sensitive equipment and human life in space. Given the potential for such damaging consequences, it is of interest to try to predict the interplanetary "weather" in the vicinity of the Earth when the Sun is active – yet, there is much work to be done before we can be confident about how any specific form of solar activity generates a disturbance at Earth.

Using the technique of interplanetary scintillation (IPS), workers at the Mullard Radio Astronomy Observatory of the Cavendish Laboratory were able to show that density variations in the solar wind could be tracked from 0.5AU* to beyond the Earth's orbit. Just as a star twinkles because of variations in the density of the Earth's atmosphere, by using radio observations they can detect the twinkling of extragalactic radio sources because of variations in the density of the interplanetary medium. It seems that the IPS technique allows a unique method for detecting the passage of huge clouds of matter as they cross the solar system.

Encouraged by these findings a consortium which includes the Cavendish Laboratory (Cambridge), the US National Oceanic and Atmospheric Administration (Boulder, Colorado, USA), the British Antarctic Survey (Cambridge) and the Rutherford Appleton Laboratory devised a scheme for refurbishing and updating the original Cambridge experiment. The refurbishment of the Cambridge array has taken a little under two years to complete and the first observations are now being produced on a daily basis, hopefully to continue for the next 11 years and more. With this kind of information, combined with the UK contribution to future solar-terrestrial missions such as the forthcoming Solar and He-

* 1AU is the so-called astronomical unit, the mean radius of the Earth's orbit

liospheric Observatory (SOHO) and Cluster missions, British scientists will be in a unique position for studying the links between activity on the Sun and events at the Earth.



By detecting the twinkling of extragalactic radio sources we can investigate the passage of clouds of matter ejected from the Sun

For more information please contact:
Dr. Richard Harrison,
Astrophysics Division,
Rutherford Appleton Laboratory,
Chilton, Didcot,
Oxfordshire OX11 0QX.
(Tel: 0235 44 6497)