In this issue

Abiotic natural gas and petroleum

Science is like a long road paved with observations, ideas, and understandings. From a distance it looks like a smooth strip of ribbon meandering through time. But up close, it can be seen as a rocky road indeed – a mix of insight and oversight, design and serendipity, precision and error, and implication and revision. The prognosis for vast potential resources from the Russian-Ukrainian theory of abiotic petroleum depends critically upon the nature and circumstance of Earth's formation. Remarkably, for decades that prognosis has been considered solely within the context of the so-called standard model of solar system formation, which has recently been shown to be incorrect as it would lead to terrestrial planets having insufficiently massive cores. Herndon's new vision of Earth formation, initially as a Jupiter-like planet, leads to a different concept of geodynamics (*Curr. Sci.*, 2005, **89**, 1937–1941), to a different mechanism of heat transport and emplacement at the base of the crust (*Curr. Sci.*, 2006, **90**, 1605–1606), and, consequently (**page 596**) leads to a greatly enhanced prognosis for abiotic natural gas and petroleum resources.

Our ultraviolet Sun

Extreme ultraviolet radiation from the Sun is an important range since it is here that radiation from gases in the Sun's atmosphere can be identified and analysed in order to map conditions throughout the atmosphere (density temperature, flow speeds sand gas constituents) – much as we map the Earth's weather. We can directly measure physical parameters such as electron density, temperature, flow speeds, etc. in the corona from emission line diagnostics. However, we cannot directly measure coronal magnetic field strength, resistivity, viscosity, turbulence, waves, etc. New powerful tools of coronal seismology have enabled the detection of MHD waves by TRACE and EIT, spectroscopic measurements of linewidths by SUMER and CDS, ion and electron temperature anisotropy measurements with UVCS, and microflares by RHESSI. For a century, astronomers have measured the photospheric magnetic field using magnetographs, which observe the Zeeman effect. A spectral line can split into two or more lines with slightly different wavelengths, and polarizations in the presence of magnetic field. But the Zeeman effect observations for the corona have yet to be done. The spectral splitting is too small to be detected with the present instrumentation, so we have to resort to mathematical extrapolation from photospheric magnetic field.

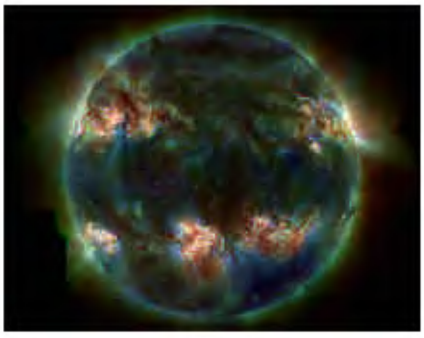

Image: Our ultraviolet Sun: Is this our Sun? Yes. Even on a normal day, our Sun is a sizzling ball of seething hot gas. Unpredictably, regions of strong and tangled magnetic fields arise, causing sunspots and bright active regions. The Sun's surface bubbles as hot hydrogen gas streams along looping magnetic fields. These active regions channel gas along magnetic loops, usually falling back but sometimes escaping into the solar corona or out into space as the solar wind. Pictured above is our Sun in three colours of ultraviolet light. Since only active regions emit significant amounts of energetic ultraviolet light, most of the Sun appears dark. The colourful portions glow spectacularly, pinpointing the Sun's hottest and most violent regions. Although the Sun is constantly changing, the rate of visible light it emits has been relatively stable over the past five billion years, allowing life to emerge on Earth. Credit: TRACE Project, Stanford-Lockheed Institute for Space Research, NASA.

High-resolution ultraviolet observations of the Sun from SOHO and TRACE spacecraft have provided a wealth of new information on plasma temperature, density, abundance anomaly, plasma flows, turbulence, wave motions, etc. in various solar structures. The article by Dwivedi (**page 587**) provides new results, especially from the line-shifts and broadenings of vacuum ultraviolet spectral lines, pinpointing the physical processes that maintain the Sun's hot corona, and accelerate the fast solar wind as well as locate its source region.