

Conference Highlights

Magnetic Fields and Oscillations¹

The third Advances in Solar Physics Euroconference (ASPE) concluded a series sponsored by the European Union (EU), but hopefully it was not the last in this format. The formula is attractive and compares well with other meetings with its “show-and-tell” character. It emphasizes participation by young scientists and (thanks to additional funding by the EU and the German Science Foundation [DFG]) participation by solar physicists from Eastern countries who have not been much exposed yet to Western science fads and fallacies.

This superbly organized meeting included 122 participants from 26 countries; 36 participants came from countries formerly behind the Iron Curtain; a politically incorrect estimate says that 48 participants were below 35 years of age, with an unusually large female-to-male ratio. This characteristic of youth is the more striking because solar physics is a perhaps overly established field exhibiting an overly senior age profile. Rejuvenation appears at work—this reviewer was particularly glad to meet high-quality postdoctoral candidates for the European Solar Magnetometry Network (also EU funded).²

In addition, the meeting was of the preferable type in which talks are limited largely to extensive reviews while the “show-and-tell” presentations are largely done in the form of posters plus brief oral introductions. This is an excellent formula in which the reviewers get enough speaking time and a sufficiently generous allocation of proceedings pages to take their task sufficiently seriously to come up with proper reviews rather than just advertising their own latest results. The relatively few oral contributions, a small fraction of the total, were well selected. The poster introductions gave the presenters a valuable opportunity to sell their product. Given an adequate poster session duration (often sorely lacking, but not here), such brief presentations do generate interest and appropriate marking in the abstract booklet to be followed by extensive discussion at the selected posters. The poster contributions will be published in the 1998 Annual Report of the Joint Organisation for Solar Observations (JOSO), which may be obtained from the Tatranska Lomnica Observatory in Slovakia.

¹ Conference was held in Potsdam, Germany, in 1998 September. Proceedings will be edited by B. Schmieder, A. Hofmann, and J. Staude and published in the ASP Conference Series.

² See the European Solar Magnetometry Network home page at <http://www.astro.uu.nl/~rutten/tmr>.

The conference topic “Magnetic Fields and Oscillations” was wide enough to cater to many interests. Magnetic fields are, of course, the major agent that makes the Sun a most interesting star to see close up; oscillations of and in the Sun are a topic of large advances in recent years; the combination, waves in magnetic structures, is an important part in the search for the holy grail of outer-atmosphere heating. Let me illustrate this by simply summarizing the invited reviews (bar one).

Instrumental aspects of solar polarimetry were ably reviewed by M. Collados (Instituto de Astrofísica de Canarias [IAC], Tenerife). The new liquid-crystal modulators, as well as the increasing sophistication of spectral Stokes vector inversion and of telescope polarization modeling, turn polarimetry from an art into a highly precise diagnostic, replacing the simple V -profile magnetography of the past decades by quantitative and reliable Stokes vector measurement at high angular resolution. The High Altitude Observatory Advanced Stokes Polarimeter at the National Solar Observatory/Sacramento Peak Dunn Telescope has led the way; the upcoming IAC Stokes instruments at the German and Swedish telescopes on Tenerife and La Palma promise high resolution; THEMIS spectropolarimetry should excel particularly in signal-to-noise ratio.

O. Steiner (Freiburg) reviewed flux-tube dynamics, including his numerical simulations with M. Schüssler, M. Knölker, and U. Grossmann-Doerth, in a beautifully presented talk. The simulations are two-dimensional, of flux “sheets” rather than three-dimensional flux “tubes”; when the chair wondered whether all that was said was bound to turn out wrong because three-dimensional reality was acknowledged to differ intrinsically, Steiner’s reaction, “Yes indeed, but the two-dimensional results fit the data so nicely,” earned laughter but also respect because these simulations indeed go a long way to explaining observed solar phenomena: the surrounding downdrafts earlier diagnosed from the “ V -profile area asymmetry,” the highly dynamical nature of convective buffeting, the formation of magnetic flux concentrations producing the “ V -profile zero crossing shift,” and the excitation of outward-bound shocks that are likely to explain spicules. Even while limited to two dimensions, these so-called Freiburg simulations represent a large advance in our understanding of the basic building blocks of photospheric magnetism.

Much larger flux tubes break through the solar surface in the form of sunspots. No detailed radiative transfer simulations yet exist for them; E. Wiehr’s (Göttingen) review on

sunspot penumbrae was therefore observationally oriented. Sunspot penumbrae present perhaps the most complex field configuration observed at photospheric levels, with their dynamic nature, as evidenced by the Evershed flow, a continuing source of puzzlement. The observational emphasis shifts to speckle image reconstruction to obtain high-resolution spectra. Even these may yet fail to reach the scales of the intrinsic morphology, however.

With J. Staude's (Potsdam) review of sunspot oscillations, the focus shifted from penumbrae to umbrae. Umbral flashes are known since Beckers's 1968 description, penumbral waves since Giovanelli's 1972 analysis. Both oscillatory phenomena are not understood, while magnetic field oscillations in sunspots were controversial for many years. New two-dimensional observations from Tenerife and *SOHO* have now proved the existence of the latter in the sunspot photosphere and challenge theorists. The *SOHO* measurements support resonant transmission of magneto-atmospheric waves in the umbral atmosphere.

Oscillations in the solar interior having to do with solar magnetism were discussed by A. G. Kosovichev (Stanford). The diagnosis is done by a new and promising technique: local helioseismology in the form of time-distance analysis in which the response of the solar surface to localized impulse excitation is measured spacetime-wise from the surroundings. Stochastically excited waves are measured through time averaging; flares appear to provide sufficiently strong impulses below the photosphere to permit direct registration of seismic waves propagating through the solar interior. An exciting prospect is to map the subsurface structure of active regions even before they appear.

The final review talk was by C. Chiuderi (Florence), who reviewed the physics of MHD waves in magnetic structures

masterfully. He emphasized the importance of the fact that the familiar decomposition of wave modes into distinct types breaks down in the nonlinear regime. Even more important is that the resulting nonlinear interaction between waves and medium leads to marked enhancement of energy dissipation possibilities.

The reviews, oral contributions, and poster presentations were by no means all of the meeting. The ASPE formula also adds extensive plenary working group sessions on topics that involve planning of Europe-wide collaboration. At this meeting these concerned solar observing techniques, solar databases, coordination between *SOHO* and ground-based observing, and preparations for 1999 August 11, when more Europeans will be eclipsed than ever before. In addition, the yearly JOSO meeting was scheduled as an extension to the ASPE conference.

Finally, various well-organized excursions did more than generate the usual (valuable) opportunity for shop talk and gossip. Visiting Einstein's summer house in the Havel side village of Caputh where the meeting was held gave a sobering impression of the great man's lifestyle. No luxury, essentials only: The pleasure of a garden and a nearby lake to sail on. Books to catch thoughts, a terrace to catch the evening sun; a pity he had to leave forever not long after acquiring it. Visiting the Einsteinturm at Potsdam, presently being renovated, together with the great refractor in the giant dome next door, illustrated the long tradition of Potsdam astrophysics with Freundlich and Schwarzschild as perhaps the most prominent giants, a memorable experience for any astrophysicist.

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