layer is located at a position $x$ such that $\omega = k v(x)$. The resonance layer has a characteristic width proportional to $|\text{Re} e|^{-1}$, where $\text{Re}$ is the magnetic Reynolds number.

Similar results have been obtained before using other methods. The relevance of these wave modes for coronal heating will be discussed.

*NAS-NRC Resident Research Associate

**WEDNESDAY AFTERNOON**

**Session 4: Magnetic Fields**

**1530–1700 (Georgian Room)**

4.1 Rates of Growth of Active Regions, L. M. Hermans, U. of Hawaii and S. F. Martin, Caltech

We have analyzed the rates of growth of a representative sample (65) of active regions (AR) which developed on the sun from Aug. 1978 thru Oct. 1979. The distribution of ARs by rate of growth of their total magnetic flux is characterized by a decreasing number of ARs with increasing rate of growth in the range from $1 \times 10^{20}$ to $160 \times 10^{20}$ Maxwells/Day. The distribution is similar in pattern to the known distributions of both sunspot group and AR lifetimes. As measured from the daily Mt. Wilson magnetograms, the majority of AR exhibit their most rapid rates of growth before the third consecutive day of observation after birth. Although only 5% (5) exhibited a higher rate of growth after than before the third day of observation, 30% were still growing after the third day. 40% of these were cases in which new AR (major quantities of discrete new magnetic flux) subsequently arose in the original AR. Such clearly "multiple" AR also comprised at least 42% of the 26 regions, with maximum early rates of growth exceeding $30 \times 10^{20}$ Maxwells/Day. We expect and find that the maximum rate of growth of ARs is correlated with their ultimate maximum size as measured by total magnetic flux, area $x$ intensity of the corresponding Ca II plage or maximum sunspot area. It appears possible to use the daily rates of growth to distinguish with a confidence of about 80% whether a given new AR will ultimately become large (ARs > 1000 units) or remain small. We speculate that move frequent and accurate measures of AR rates of growth would yield tighter correlations between rate of growth, maximum AR magnitude, and time to fully emerge, especially if each new discrete emergence of one AR within another is measured independently. The contribution of SPM was supported by AGDR AFR grant 82-0018 and that of L.M.H. by NASA grant NGL 12-001-011.

4.2 Magnetic Flux Emergence in the Solar Atmosphere

C.R. DeVore, BAA, and J.P. Boris, NRL

We have developed a two-dimensional, time-dependent magnetohydrodynamics simulation code to model the process of magnetic flux emergence on the Sun. Recent theoretical results indicate that sufficient energy may be released by this mechanism to heat the corona and power the solar wind. In order to test this hypothesis, we are conducting detailed numerical simulations of buoyant magnetic flux tubes rising through the chromosphere and emerging into the corona. We will present some results from these calculations and discuss their implications for the energy balance of the corona.


Work supported by NASA and ONR.

4.3 Meridional Flows and Magnetic Flux Transport on the Sun

J.P. Boris, M.R. Sheeley, Jr., T.R. Young, Jr., NRL, C.R. DeVore, BAA, and K.L. Harvey, BPCC

We have conducted large-scale numerical simulations of magnetic flux transport in the solar photosphere due to differential rotation, meridional flow, and turbulent diffusion. Previously we reported the results of a study carried out with no meridional flow in the calculations, in which we obtained a best-fit diffusion constant of $720 \text{ km}^2/\text{s}$. Recent simulations show that inclusion of a poleward meridional flow of $10 - 20 \text{ m/s}$ leads to a significant reduction in the error between the computed and observed fields, and in the optimum value of the diffusion constant, to $360 \text{ km}^2/\text{s}$. This result suggests that diffusion and meridional currents both play an important role in transport of magnetic flux on the solar surface.


Work supported by NASA and AFGL.

4.4 A Wavelength Calibration Device for the Mount Wilson Magnetograph

D.R. Bruneusing, and R. Howard, MWO.

An iodine absorption tube has been installed at the exit slit of the new magnetograph assembly at the 150-foot Tower Telescope. Instrumental difficulties encountered during the implementation of the reference system, as well as the data taken to date, will be described.

4.5 Magneto-optic Effects As They Are Seen By The MSFC Vector Magnetograph

T. A. West, MSFC

Observations have been made at the MSFC vector video-magnetograph. These data are then compared to theoretical calcula-