bright points are overdamped systems with $\Omega \approx 1 / \tau \approx 0.3$ (e.g., as a result of Parker's dynamical dissipation) while older active region and large-scale loops are underdamped systems with $\Omega \approx 10$ (e.g., as a result of ionoson's resonant heating by compression of viscous dissipation). Since active region and large-scale loops are underdamped systems, they are heated at a rate that is independent of the dissipation process. This means that we cannot prove the validity of a particular dissipation process by observing the radiative flux as a function of loop length and field strength. For these underdamped systems the dissipation process can be identified only by evaluating the connection between dissipation and the coronal velocity (e.g., observed as coronal line broadening).

3.2 On Heating the Lower Transition Region with Fine-Scale Currents. D. M. Rabin, NRC/MSFC, and R. L. Moore, MSFC. Thermal Conduction, mass flow and NH3 waves are the most frequently discussed mechanisms for heating the lower transition region ($T \approx 10^5$ K). However, observations fail to reveal the necessary energy flux in waves (Athay and White, 1978, Ap. J., 266, 1139) and energy-balance models incorporating both conduction and flow fail to produce enough emission (Athay, 1982, Ap. J., 263, 982). This motivates us to consider the properties of electric currents that could heat the lower transition region (supply at least the Lyα radiative loss) through ohmic dissipation, a mechanism often proposed (e.g., Rosner et al., 1978, Ap. J., 226, 317) to heat coronal plasma. Recent observations with the MSFC vector magnetograph and the SMM Ultraviolet Spectrometer and Polimeter have shown that most of the Lyα emission in an active region is not associated with detectable vertical currents at the photosphere; moreover, the observed current maxima do not coincide with Lyα maxima. Assuming that, summed over the 5×5° magnetograph resolution element, the current in the transition region is comparable to the vertical current in the photosphere, we demand that the mean transition region current fall below the magnetograph detection limit. The magnetic field in the transition region is assumed to be 100 gauss or less. We consider several simple models of filamentary currents that satisfy these assumptions and observational constraints. In all the models, the constraints require that the currents be of extremely fine scale, $d \approx 20$ km ($0.03\ arc$), fill less than 0.1% of the surface and be well-distributed ($\leq 100$ elements in $1°$). Since the MSFC magnetograph cannot yet detect such currents, the observed lack of correspondence between currents and UV brightness does not argue against the hypothesis of ohmic heating. This research is supported by the NRC and by the NASA Office of Solar and Heliospheric Physics.

3.4 Fast Magnetic Reconnection by the Relativistically Coupled Radiative Instability. G. Van Hoven and R. S. Steinolfson, Univ. of California, Irvine. The thermal (Field, Ap. J. 152, 531 (1965)) and tearing (Furfey, Killeen, and Rosenbluth, Phys. Fluids 6, 459 (1963)) instabilities give rise to the development of filaments and the interconnection of magnetic fields. We are investigating the co-existence of these physical mechanisms in the case when Coulomb resistivity couples the energy evolution to the plasma dynamics. We find that the analogue of the thermal mode, which still develops on the radiative time scale, involves significant magnetic-field reconnection. When compared on the basis of equal magnitudes of nonlinear terms, the fast radiative mode provides some 30% of the reconnecting magnetic flux associated with the much slower ($<10^{-2}$ in growth rate for solar coronal conditions) tearing mode. This finding opens the possibility for a more rapid initiation of flare energy release than had previously been thought feasible.

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3.3 Inhibition of Heat Conduction by Magnetic Constriction in the Transition Region: Dependence on Tube Shape. J. F. Donnelly, Jr., R. L. Moore, NASA/MSFC, and S. T. Wu, UAH. To clarify the effects of the shape and amount of magnetic constriction on the inhibition of heat conduction in the quiet Sun transition region, we analyze the steady-state heat flow in model tapered flux tubes in which the plasma properties are constant on cross sections, the plasma is static, and the only energy transfer process is thermal conduction. We find the following:

1. The amount of inhibition (the reduction in heat flow from that in the unconstricted tube, denoted by $\delta Q$) is simply the harmonic mean of the tube area, which means it is determined by the shape and amount of constriction. (2) The amount of constriction (ratio of the hot end area to the cold end area, denoted by $r$) sets the range of possible values of the inhibition $\delta Q / Q_0$ : $r^{-1} \leq \delta Q / Q_0 \leq 1$; the value of $\delta Q / Q_0$ within this range is set by the shape of the tube. Therefore, the shape of the constriction is as important as the amount of constriction in determining the amount of inhibition. (3) For the linear taper of a cone-shaped tube, the inhibition-constriction relation is simply $\delta Q / Q_0 = 1 / 2$. This formula estimates the inhibition to order of magnitude for any tube in which the constriction occurs gradually all along the tube.

These results are applied to the chromosphere-corona transition region of the quiet Sun.