nism inadequate. We therefore propose a model in which the excitation of instabilities converts the energy associated with the current-related magnetic field into particle heating energy. The resulting heating rate is shown to exceed the energetic requirements of the loop, so that the heating mechanism proceeds via short bursts, corresponding to an intermittent disruption of the current sheath configuration.

Because of the relatively low transverse thermal conduction, only a small fraction of the loop volume is heated and exhibits a much higher temperature than the average value. This is consistent with the experimental observations of relatively low filling factors of very hot gas in coronal loops (Mariens et al. 1985, Solar Phys. 96, 253). When the self-disruption of the current sheath occurs, the thermal energy will be rapidly dispersed into a larger volume but at lower temperature.

We present a self-consistent model, involving a repeated sequence of dynamic events which takes into account the observed loop topology, the differential emission measure distribution in the $10^6$–$10^7$ K range, the energy balance requirements in the loop and the probable duty cycles involved in the heating process.

20.11
Critical Frequencies and Reflection of Fast Mode Waves in an Isothermal Atmosphere
Beverly A. Stark and Z. E. Musilek (UAH)
We introduce a new relationship for the critical frequency associated with the propagation of fast mode waves in an isothermal and magnetized atmosphere. This is achieved by transforming the wave equation to the Klein-Gordon form where the critical frequency appears explicitly as a coefficient. We verify previous findings that for fast mode waves the critical frequency is influenced by both the gas and magnetic pressure, although the relationship is different from that previously obtained. Numerical simulations are run to verify analytical results and to investigate the physics of wave reflection. The obtained results are discussed in terms of their application to the solar physics.

Session 21: Transition Region and Corona

21.01
Dynamical evidence of fine structure in the solar transition region
P. Brekke, O. Kjeldseth-Moe (University of Oslo), J.-D. F. Bartoe, G. E. Brueckner (NRL)
The presence of several distinctive flow velocities within small solar regions of $1 \times 1$ arc second constitutes new evidence for a sub-arcsecond extreme fine structure in the solar transition region. The multiple velocities are shown clearly in the supersonic downflows of gas from the corona to the chromosphere above sunspots. Observations with the High Resolution Telescope and Spectrograph – HRTS – both on rocket flights and on Spacelab 2, reveal that they are not exclusively a property of sunspot downflows, but are also present in other solar regions.

Previously the presence of such fine structure has been deduced from the measured extent in altitude of the transition region and by comparing the emitted radiation in the C IV lines at 1550 Å with measured gas densities from pressure sensitive lines using observations from S082B on Skylab in 1973 and later from HRTS.

In the HRTS data the multiplicity is not restricted to the regions emitting the C IV lines, but occur throughout the chromosphere and lower transition zone. We present an analysis of the dynamical evidence for extreme fine structure in the transition region using the Si IV lines at 1402 Å. Gas velocities, line widths and intensities are measured from the line profiles by fitting the profiles to a set of Gaussian components using a least squares method. Both quiet and active regions are studied. The relation of the observed supersonic flow velocities to possible shocks in the flow is briefly discussed.

21.02
Solar Doppler Shift Measurements in the Ne VII 465 Å Emission Line
J. T. Mariska (NRL), J. F. Dowdy (NASA/MSFC)
Transition-region emission lines formed near 10^6 K are Doppler shifted to the red, suggesting that downflowing plasma dominates the emission at that temperature. A very small number of measurements in the O V 1218 Å emission line show no Doppler shifts at about 2.5 x 10^5 K. Little, however, is known about Doppler shifts in higher temperature transition-region lines. To search for Doppler shifts in higher temperature lines, we have examined a unique pair of spectrophotograms obtained with the NRL S082A experiment on Skylab on 1974 January 22. After the first spectrophotogram was exposed, the dispersion direction of the instrument was rotated 180° for a second exposure. The location of any feature on an individual image is determined by its location on the Sun and its Doppler shift. Because of the 180° spectrograph rotation, however, when the two images are co-aligned, the Doppler shifted component of a feature's location will be in different directions on the two images. In particular, features that are Doppler shifted will be separated on the two images by a distance corresponding to twice the Doppler shift. After co-aligning the Ne VII 465 Å emission line images (temperature of formation about 5 x 10^6 K) on the two spectrophotograms by cross correlating the limb portions of the data, we find no evidence for ubiquitous quiet-Sun Doppler shifts greater than about 10 to 15 km s^{-1}, which is our conservative estimate of the sensitivity of the data. Active regions show measurable Doppler shifts of tens of km s^{-1}. Many features in the quiet Sun portion of the images change substantially in the 3.5 minutes between the exposures.

This work was supported by basic research funds from the Naval Research Laboratory.

21.03
The Solar UV Continuum 1440 – 1680 Å
O. Kjeldseth-Moe, P. Brekke (University of Oslo), J.-D. F. Bartoe, G. E. Brueckner (NRL)
The solar UV continuum has been derived from intensity calibrated observations with the High Resolution Telescope and Spectrograph – HRTS – on its second rocket flight in 1978. A database has been constructed for the spatially resolved solar spectrum 1180 Å to 1700 Å along a slant running from near sun center to the solar limb through a sunspot and two active regions. The angular resolution is approximately 1 arc second.

The analysis includes more than 1600 separate spectra from both quiet and active solar regions in the full center to limb