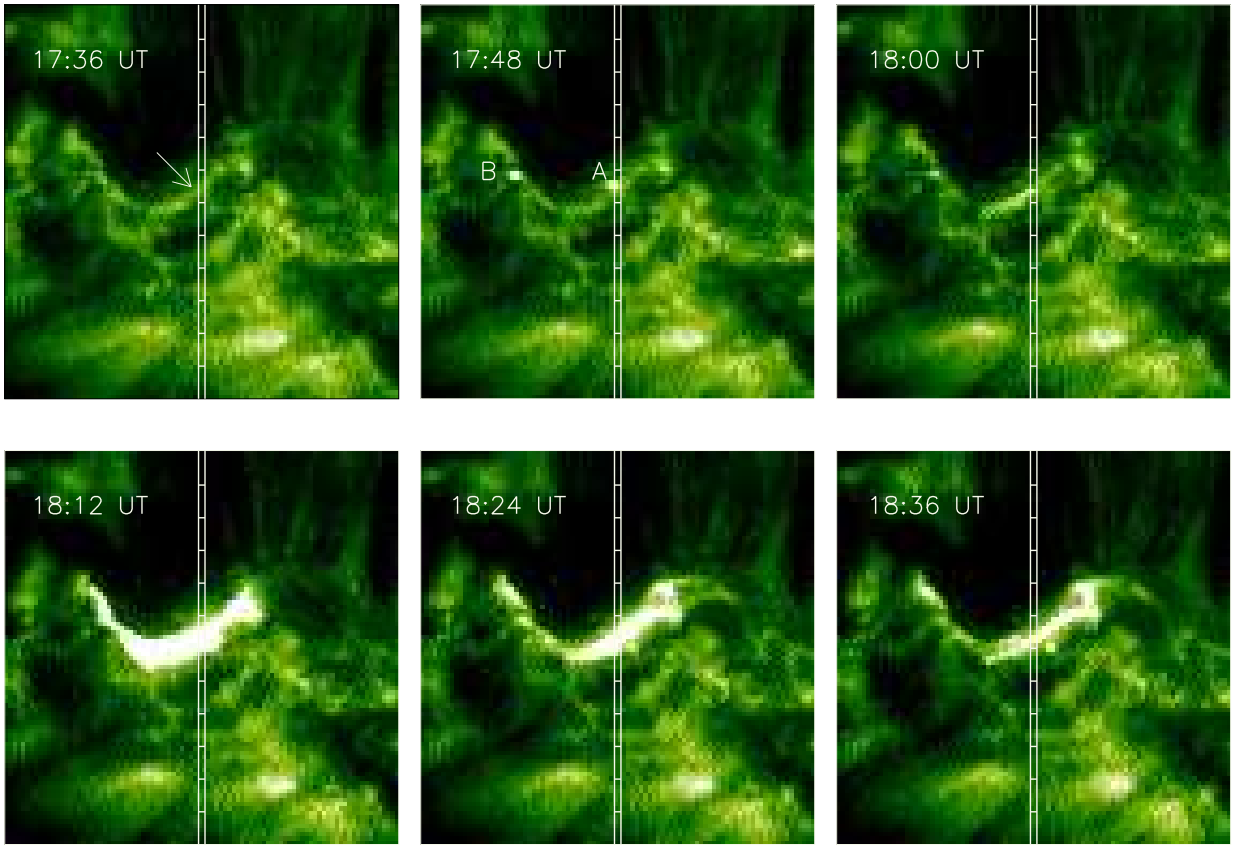
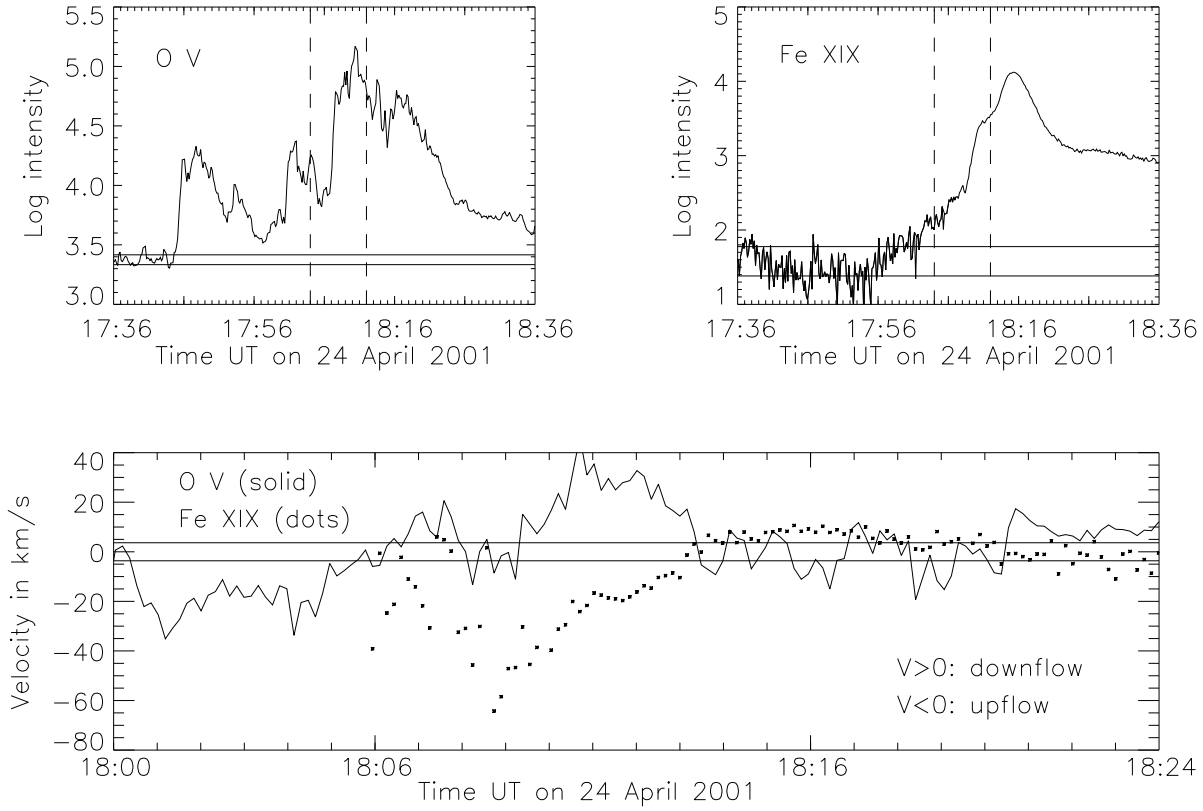
Chromospheric Evaporation During a Solar Flare: Fig. 1



These observations provide strong evidence for chromospheric evaporation during a solar flare. Chromospheric evaporation occurs when energy released in the solar corona during a flare is deposited in the chromosphere much more quickly than it can be radiated away. As chromospheric material heats, it expands rapidly upward (producing Doppler blueshifts) into the low-density corona and slowly downward (producing redshifts) into the high-density chromosphere. The above six frames show a sequence of $4' \times 4'$ images observed at 195 Å with the Extreme-ultraviolet Imaging Telescope (EIT) aboard the *SOHO* spacecraft between 17:36 and 18:36 Universal Time (UT) on 2001 April 24, showing the field of view of the 4 arcsec $\times$ 4 arcmin slit of the Coronal Diagnostic Spectrometer (CDS on *SOHO*) within Active Region 9433. Horizontal tick marks indicate the endpoints of the twelve $4'' \times 20''$ spatial pixels into which the CDS spectra were averaged. The times at which the images were obtained are given in the upper left corner of each frame. Spectral data analyzed here are from the 7th slit pixel up from the bottom (source A), indicated with an arrow at 17:36 UT; flare sources A and B are indicated at 17:48 UT. Solar north is up and west is to the right.

Chromospheric Evaporation During a Solar Flare: Fig. 2



Logarithms of emission line intensities (in erg cm^{-2} s^{-1} sr^{-1}) measured with CDS for an O^{+4} ion (O V, formed at 2.5×10^5 K) at 629.7 Å (top left) and an Fe^{+18} ion (Fe XIX, formed at 8×10^6 K) at 592.2 Å (top right) as functions of time in source A of Figure 1. Solid horizontal lines indicate preflare quiescent average values $\pm 1\sigma$. The bottom frame compares Doppler velocities in km s^{-1} measured for Fe XIX (dots) and O V (solid) for the second of two flare precursors ($\sim$ 18:00 - 18:05 UT) and the flare impulsive phase. Negative velocities correspond to upflows (blueshifts) and positive to downflows (redshifts). Solid horizontal lines indicate $\pm 1\sigma$ from rest. The upflow observed in O V during the second precursor occurs during "gentle" chromospheric evaporation, while upflow observed in Fe XIX during the impulsive phase occurs during "explosive" evaporation. The association between downflow (positive) velocities in the cool lines and upflow (negative) velocities in Fe XIX indicates conservation of momentum during chromospheric evaporation. [From J. W. Brosius & K. J. H. Phillips, *The Astrophysical Journal*, vol. 613, p. 580 (2004 Sep. 20).]