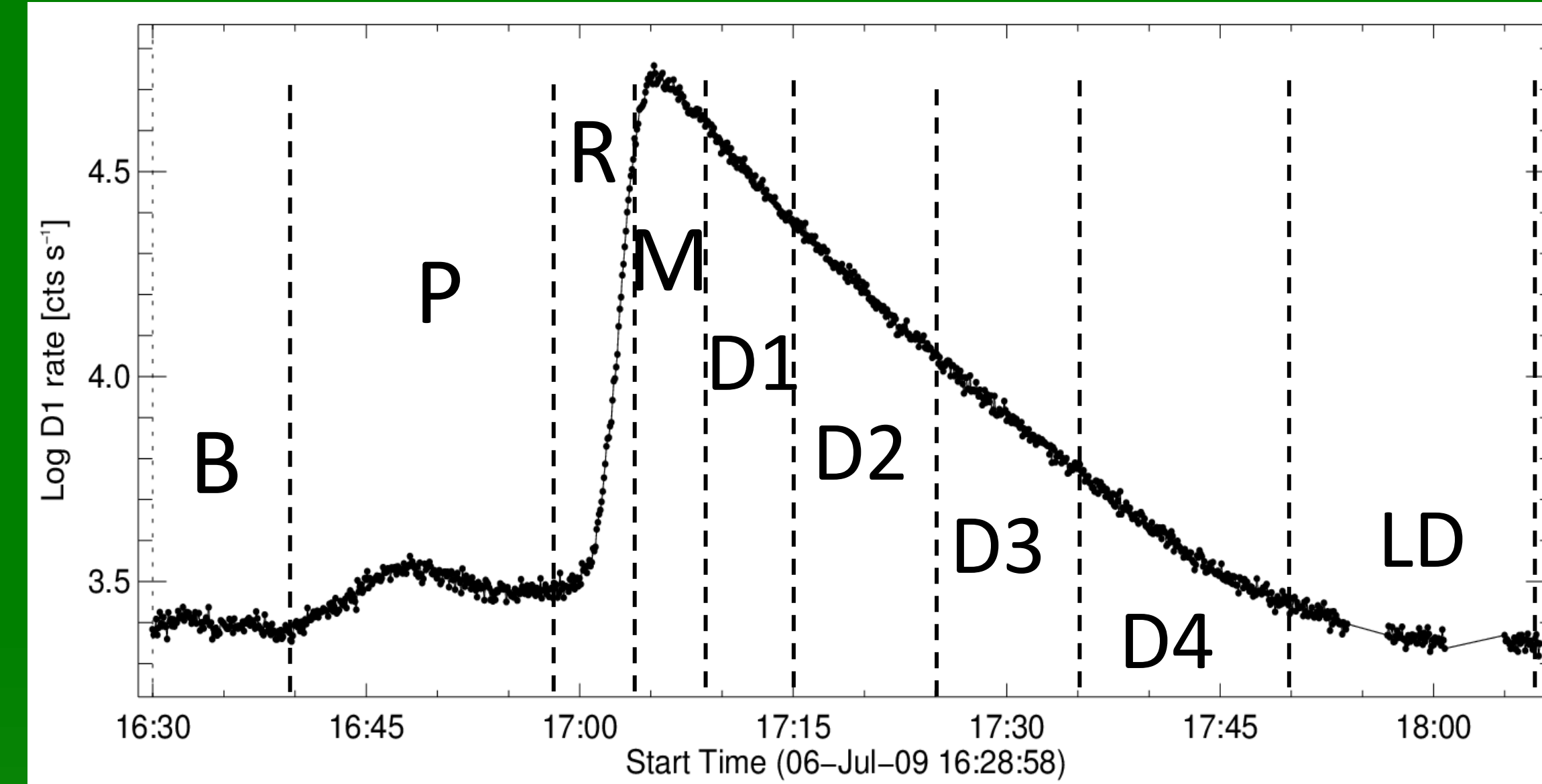


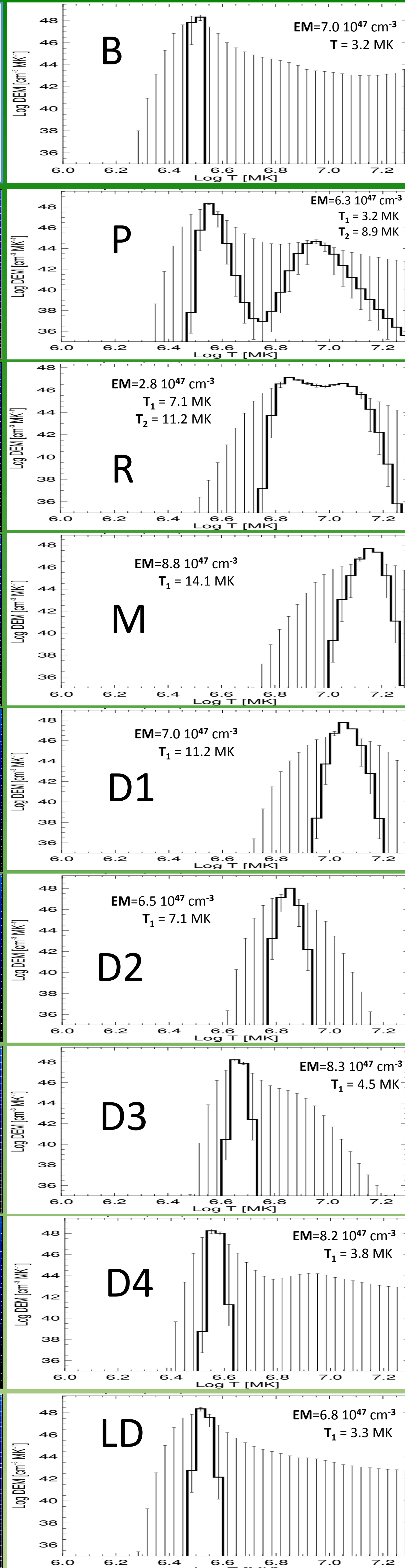
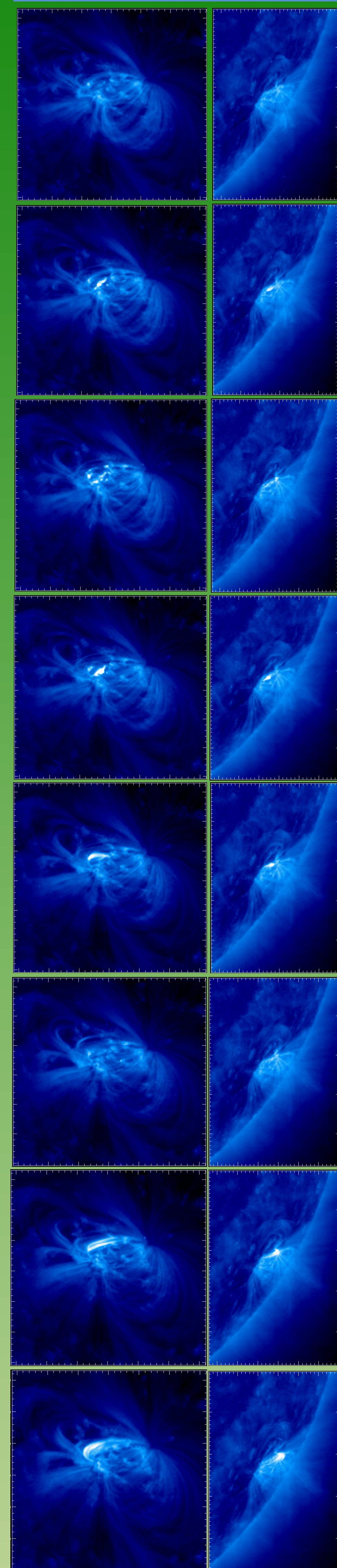
Temperature distribution of solar coronal plasmas calculated based on SphinX X-ray spectra and other space observations



C1.0 SOL2009-07-06T17:05

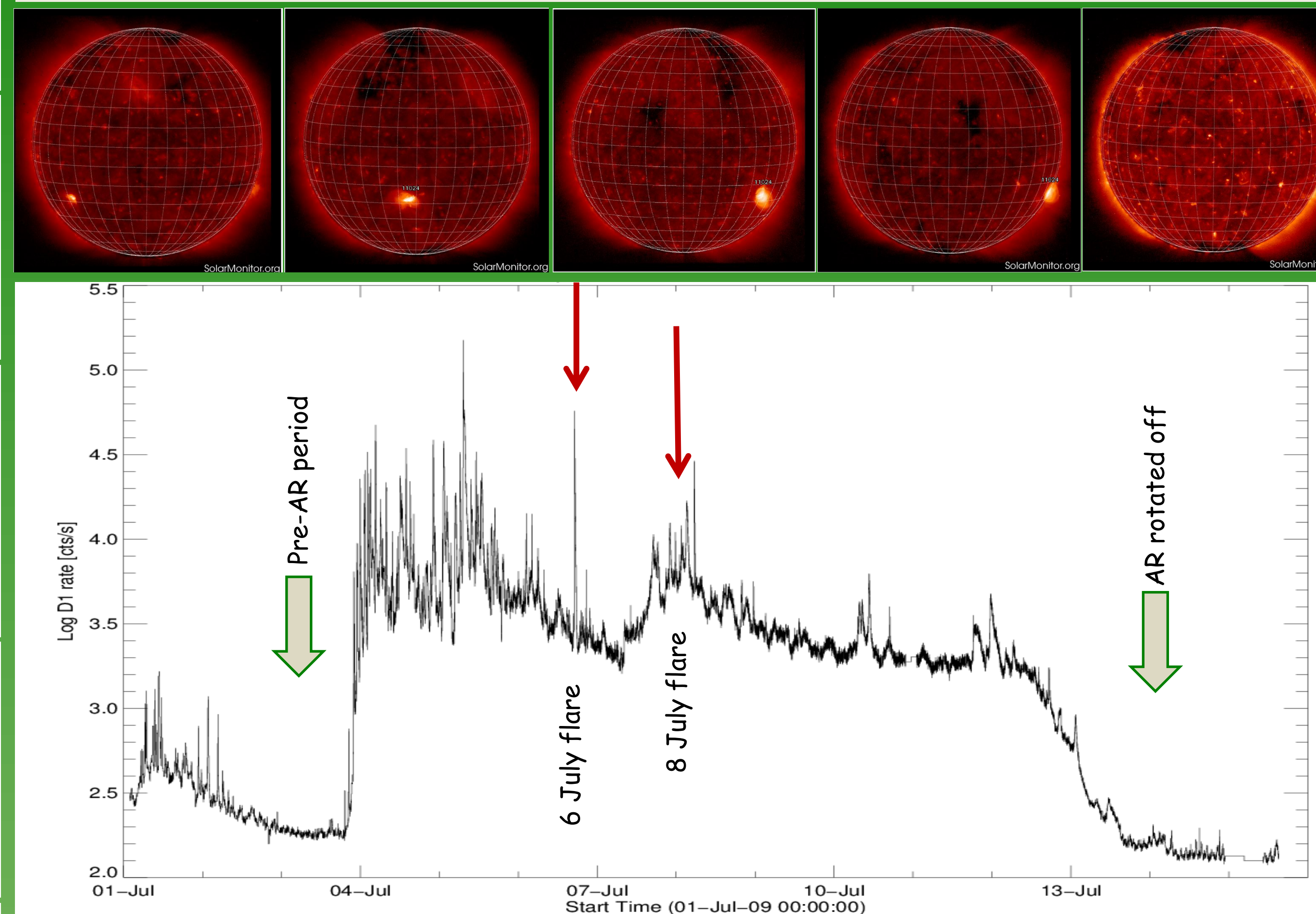


For SOL2009-07-06T17:05 flare XRT images were not available, so below we present pairs of times corresponding to STEREO A (left) and STEREO B images obtained using 171 Å filter showing ~1 MK plasma.

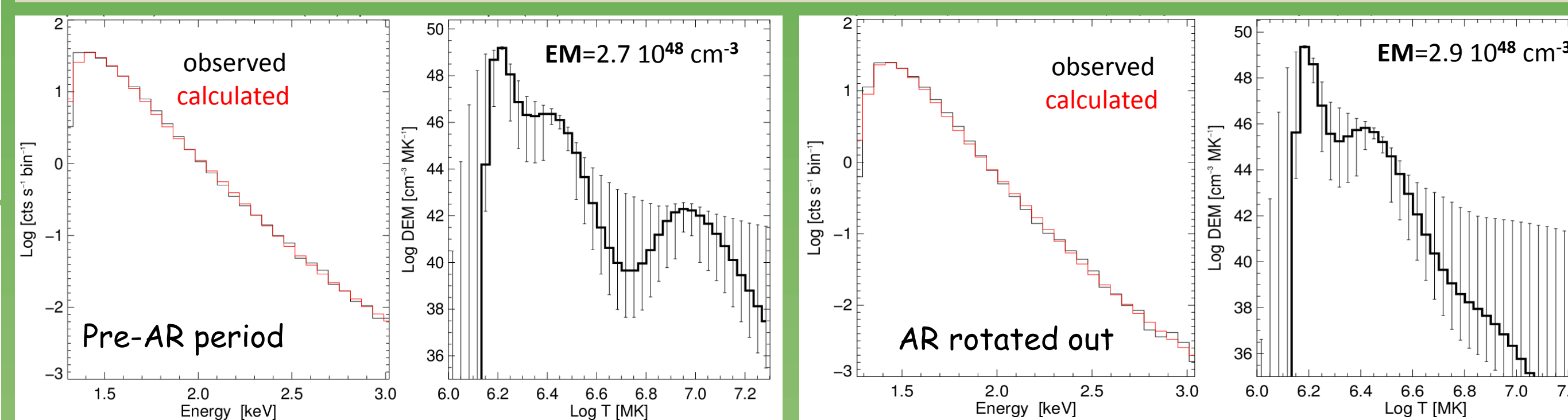


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We have analyzed solar X-ray spectra obtained during the deep solar minimum in 2009 with the Polish full-disc spectrometer **SphinX** (Solar **Ph**otometer in **X**-rays) placed aboard *CORONAS-Photon*. The unprecedented sensitivity and energy resolution of SphinX enabled us to measure the spectra in 256 energy intervals covering spectral range between ~1 keV and 15 keV. The spectra were collected every 5 sec. The instrument was carefully calibrated before launch using synchrotron emission. Thanks to this the reduced spectra are of a high absolute accuracy. For this research we selected flares occurring in active region AR 11024 born on the disk on 3 July. This single AR rotated off the disk on 15 July 2009. More than 500 events i.e. flares or small brightenings have been identified on the soft X-ray lightcurve during that time. Here we present the results for two selected flares namely a C1.0 flare on 6 July at 17:05 UT (left panel) and a B1.8 flare on 8 July at 03:13 UT (right panel) which differ in their duration and maximum temperature. We derived differential emission measure distributions (DEM), using as input the measured spectra in each energy bin from 1.26 - 4 keV interval for which there were sufficient count rates. The iterative Withbroe-Sylwester (Sylwester et al., 1980, Sol. Phys. 40) DEM inversion method has been used with the pre-flare spectra subtracted in each case to get the DEM for the flare emission only. For each event, a sequence of DEMs are presented here showing how the plasma temperature distribution evolves with time. The letters in the figures denote: B = before flare, P = precursor, R = rise, M = maximum, D = decay, LD = late decay.



X-Ray lightcurve of AR 11024 as seen by SphinX

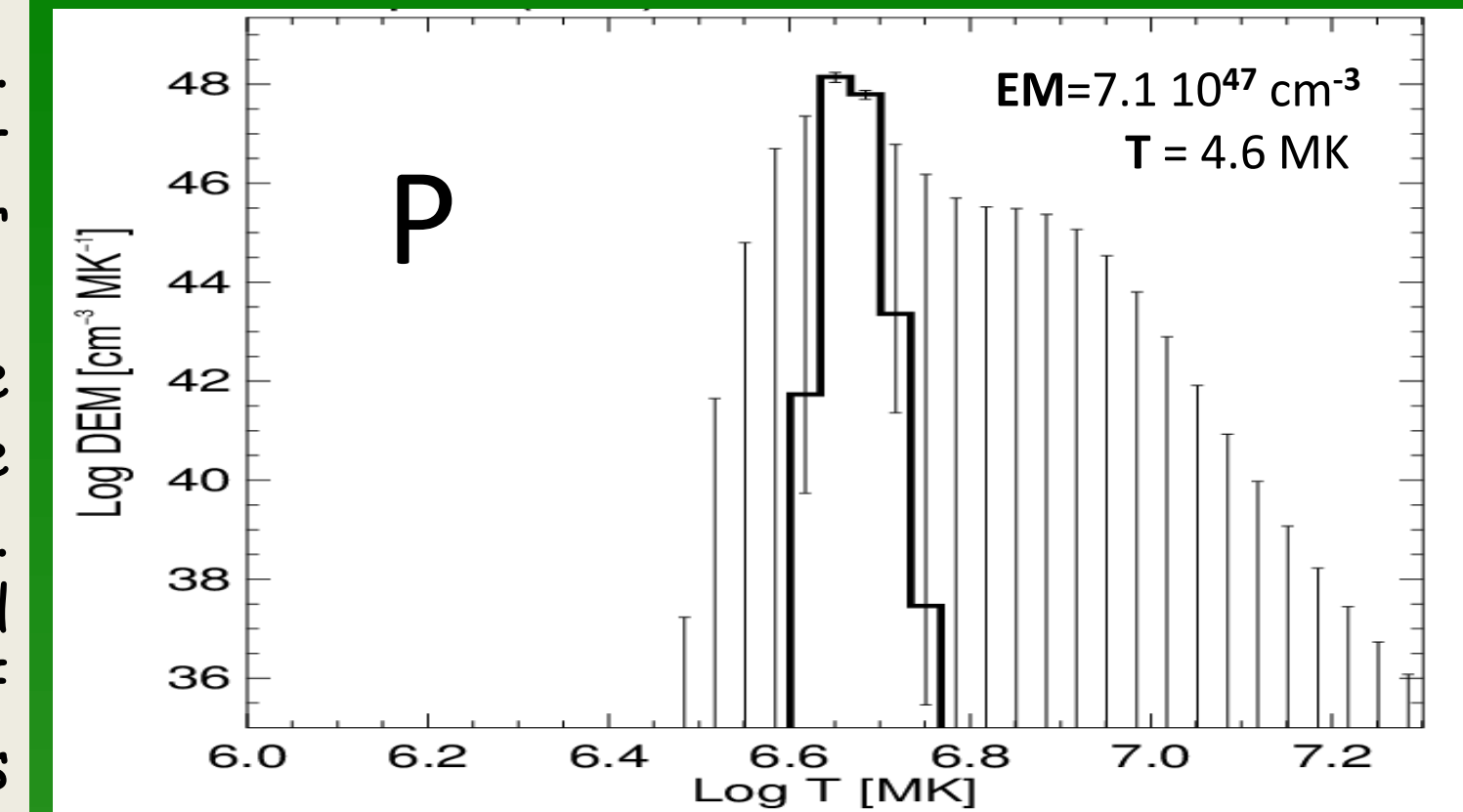
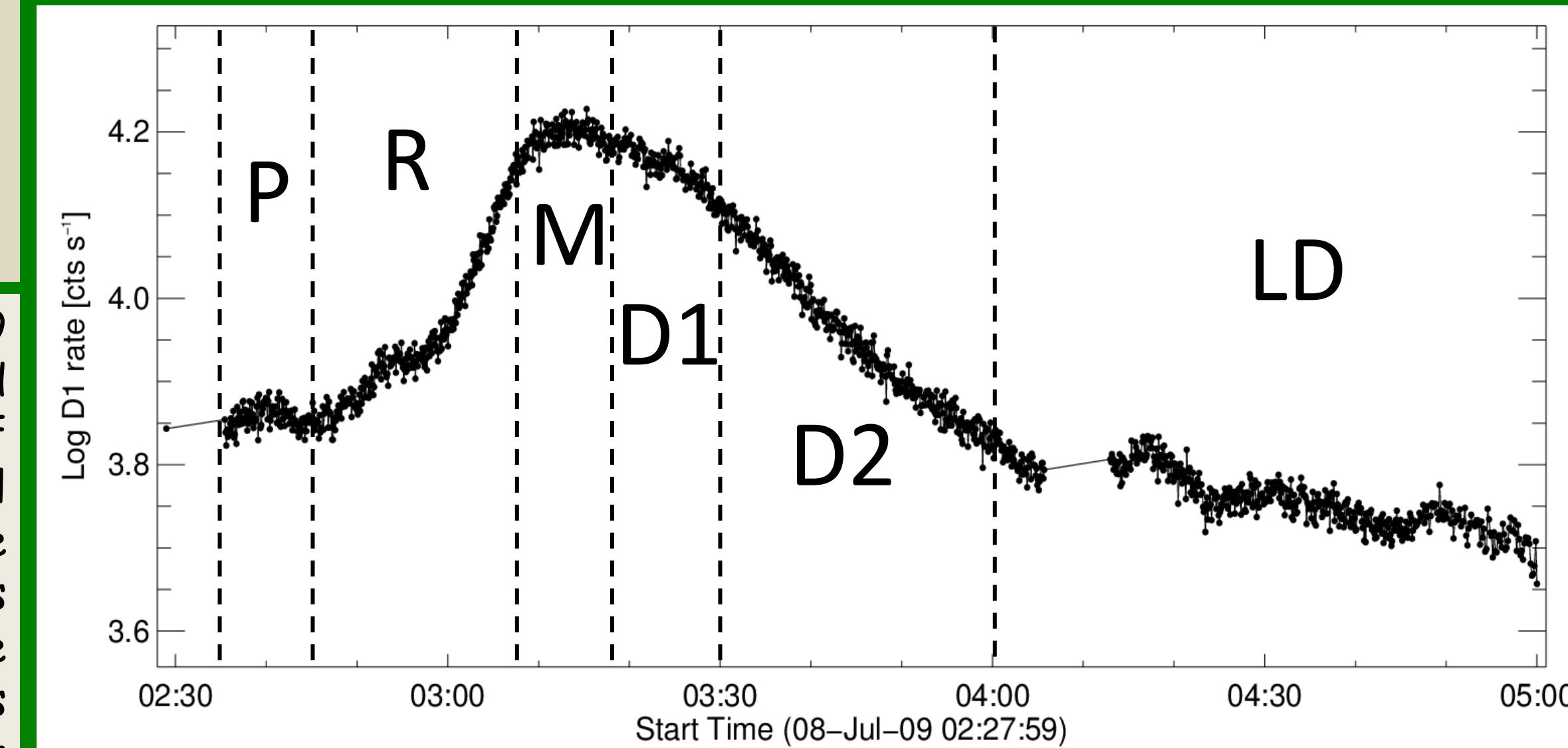


For times before the active region appeared and after it rotated off the limb, the DEMs show that the quiet corona has two temperature components with $T=1.6$ MK and $T=2.6$ MK. Just before the AR appears, a small amount of hotter (10 MK) plasma is present which can probably be attributed to the decaying of AR 11023 preceded the Ar 11024. This high-T emission is no longer seen after AR 11024 rotated off the limb.

CONCLUSIONS

- SphinX spectra enable us to find the temperature distribution of flaring plasma.
- Flaring plasma consists of blobs of matter with well defined discrete temperatures.
- Calculated DEM profiles will be further used to study the heat transport within flaring volume with the support of imaging available from Hinode XRT and STEREO.

B1.8 SOL2009-07-08T03:12



DEM distributions calculated from spectra in the range 1.26 - 4.0 keV (48 spectral bins) with sufficient count rates.

Below, Hinode XRT images (Be medium filter) are shown with the post-flare image subtracted.

