DEM analysis of the AR core and the κ–distributions

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DEM

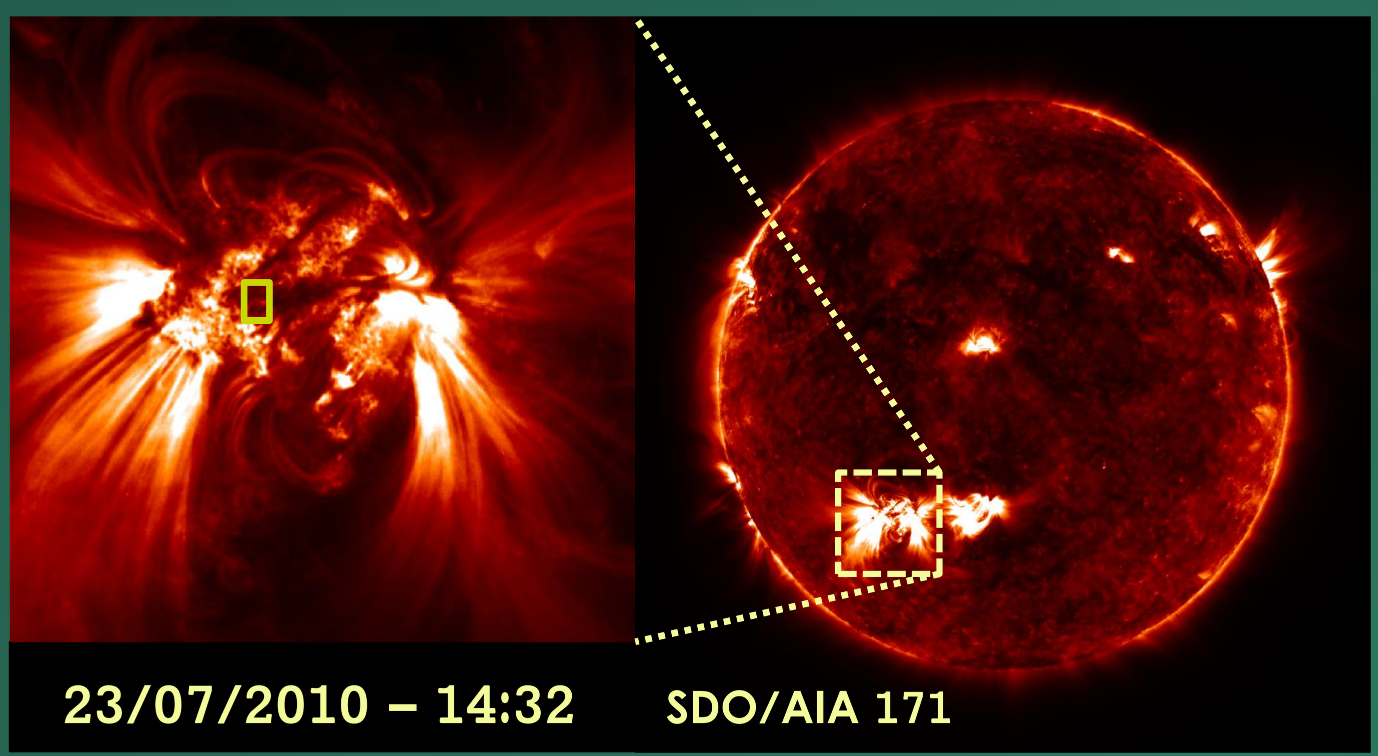
Differential Emission Measure

$$I(\lambda_{ij}) = A(X)\int_T G(T, \lambda_{ij}, n_e)\, DEM(T)\, dT$$

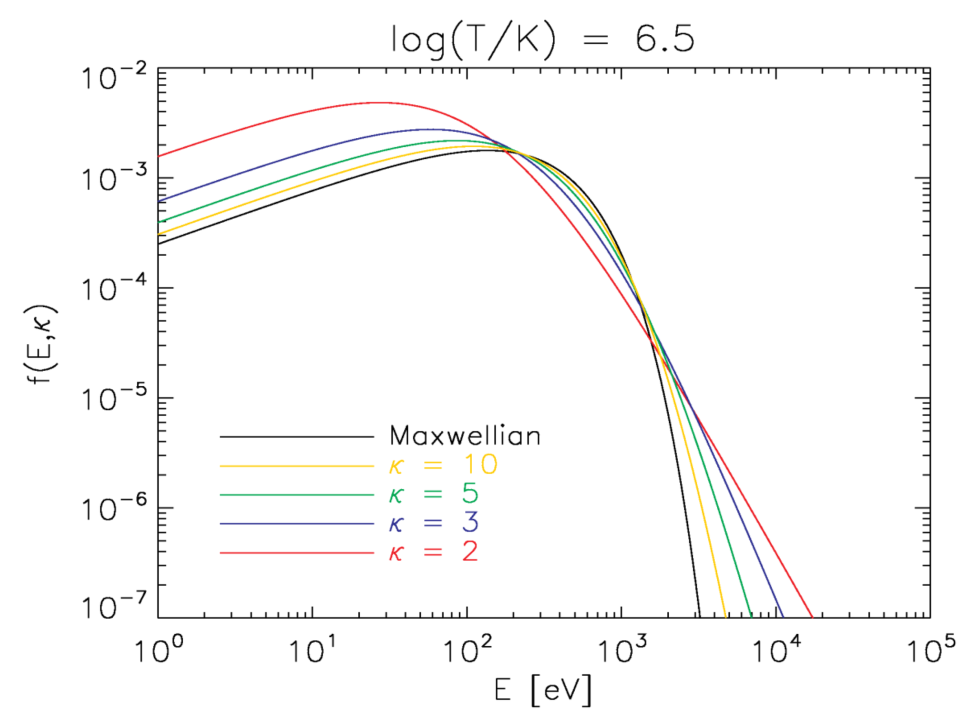
$$DEM(T) = n_e^{\,2}\, dh / dT$$

DEM(T) gives an indication of the amount of plasma along the line of sight that contributes to the observed radiation and has a temperature between T and T+dT.

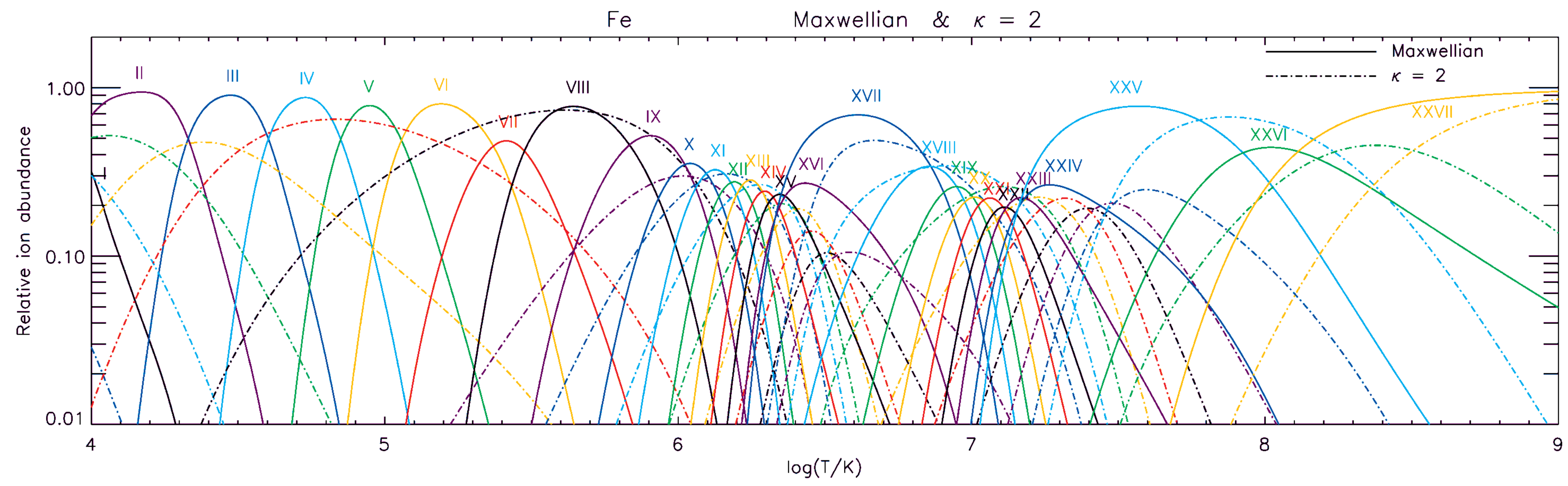
AR core – AR 11089



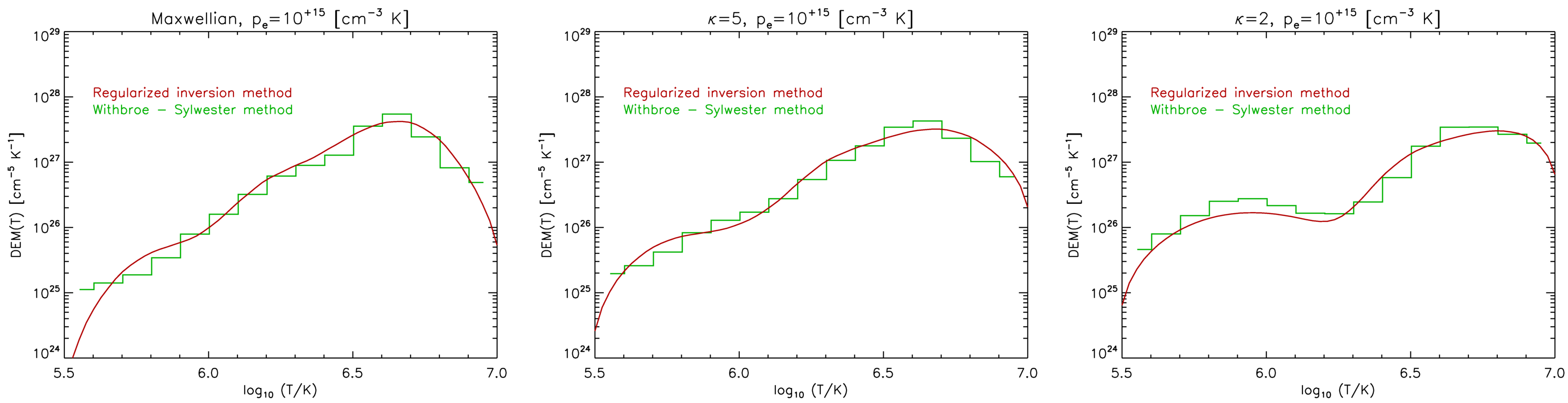
κ–distributions



- non–Maxwellian distribution of particle energies
- enhanced number of particles in the high–energy tail
- successfully diagnosed in the solar transition region and solar wind
- influence on the spectral line intensities and temperature range of line formation mainly through the changes in the ionization equilibrium (the figure below) – Dzifčáková & Dudík (2013)

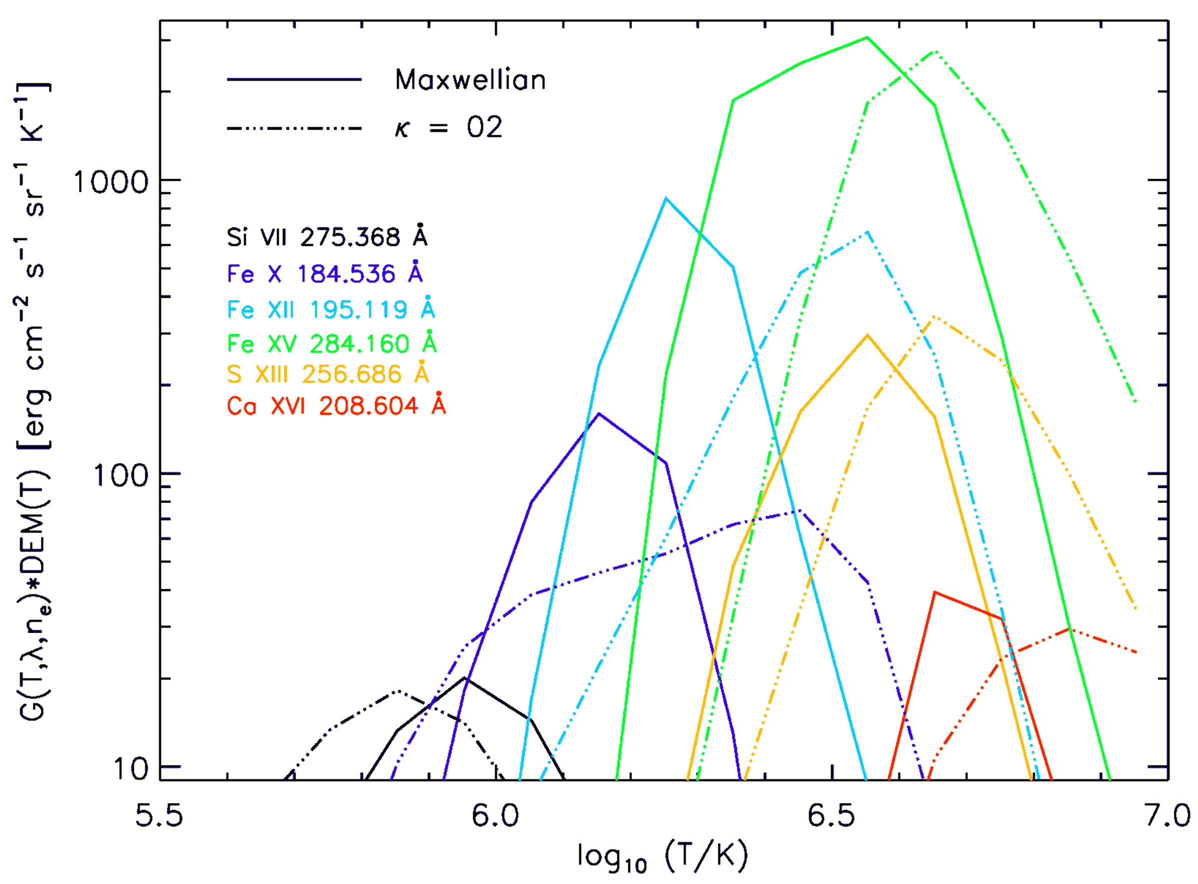


DEM reconstruction from Hinode/EIS intensities



- intensities of 19 spectral lines observed by Hinode/EIS (Warren at al., 2012; region 8)
- Regularized inversion method (Hannah & Kontar, 2012) & Withbroe – Sylwester method (Sylwester et al., 1980)
- the κ–distributions widen the interval and shift the peak of temperature distribution dedicated by DEM

What temperature range can we see in AR for the κ–distributions?



- the κ–distributions broaden the temperature range in which the spectral lines are formed
- the maxima of $G(T,\lambda,n_e)$*DEM are shifted to higher temperatures for lines formed at coronal temperatures ($T > 10^6$ K)
- the maxima of $G(T,\lambda,n_e)$*DEM are shifted to lower temperatures for lines formed in transition region ($T < 10^6$ K)
- the known temperature structure of the solar corona is crucial for correct interpretation of the emission spectral line intensities and diagnostics of the distribution shape (Dzifčáková & Kulinová, 2011; Mackovjak et al., 2013)

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