Abstract: We present an extensive study of the BL Lac object Mrk 501 based on a data set collected during the multi-instrument campaign spanning from 2009 March 15 to 2009 August 1 which includes, among other instruments, MAGIC, VERITAS, Whipple 10-m, Fermi-LAT, RXTE, Swift, GASP-WEBT and VLBA. We find an increase in the fractional variability with energy, while no significant interband correlations of flux changes are found in the acquired data set. The higher variability in the very high energy (>100 GeV, VHE) gamma-ray emission and the lack of correlation with the X-ray emission indicate that the highest-energy electrons that are responsible for the VHE gamma-rays do not make a dominant contribution to the ~1 keV emission. Alternatively, there could be a very variable component contributing to the VHE gamma-ray emission in addition to that coming from the synchrotron self-Compton (SSC) scenarios. The space of SSC model parameters is probed following a dedicated grid-scan strategy, allowing for a wide range of models to be tested and offering a study of the degeneracy of model-to-data agreement in the individual model parameters. We find that there is some degeneracy in both the one-zone and the two-zone SSC scenarios that were probed, with several combinations of model parameters yielding a similar model-to-data agreement, and some parameters better constrained than others. The SSC model grid-scan shows that the flaring activity around 2009 May 22 cannot be modeled adequately with a one-zone SSC scenario, while it can be suitably described within a two-independent-zone SSC scenario. The observation of an electric vector polarization angle rotation coincident with the gamma-ray flare from 2009 May 1 resembles those reported previously for low frequency peaked blazars, hence suggesting that there are many similarities in the flaring mechanisms of blazars with different jet properties.
FITS files:

Figures from paper (click to get full size image): N/A.