The long-lasting activity of 3C 454.3. GASP-WEBT and satellite observations in 2008-2010

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(Submitted on 6 Jul 2011)

We present multiwavelength observations of 3C 454.3 from April 2008 to March 2010. The radio to optical data are mostly from the GASP-WEBT, UV and X-ray data from Swift, and gamma-ray data from the AGILE and Fermi satellites. We improved the calibration of optical-UV data from the UVOT and OM instruments and estimated the Lyalpha flux to disentangle the contributions from different components in this spectral region. The observations reveal prominent variability above 8 GHz. In the optical-UV band, the variability amplitude decreases with increasing frequency due to a steadier radiation from both a broad line region and an accretion disc. The optical flux reaches nearly the same levels in the 2008-2009 and 2009-2010 observing seasons; the mm one shows similar behaviour, whereas the gamma and X-ray flux levels rise in the second period. Two prominent gamma-ray flares in mid 2008 and late 2009 show a double-peaked structure, with a variable gamma/optical flux ratio. The X-ray flux variations seem to follow the gamma-ray and optical ones by about 0.5 and 1 d, respectively. We interpret the multifrequency behaviour in terms of an inhomogeneous curved jet, where synchrotron radiation of increasing wavelength is produced in progressively outer and wider jet regions, which can change their orientation in time. In particular, we assume that the long-term variability is due to this geometrical effect. By combining the optical and mm light curves to fit the gamma and X-ray ones, we find that the gamma (X-ray) emission may be explained by inverse-Comptonisation of synchrotron optical (IR) photons by their parent relativistic electrons (SSC process). A slight, variable misalignment between the synchrotron and Comptonisation zones would explain the increased gamma and X-ray flux levels in 2009-2010, as well as the change in the gamma/optical flux ratio during the outbursts peaks.

Comments:	17 pages, 9 figures, accepted for publication in A&A
Subjects:	**Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Journal reference:	A&A 534, A87 (2011)
Cite as:	**arXiv:1107.1093 [astro-ph.CO]**
	(or **arXiv:1107.1093v1 [astro-ph.CO]** for this version)

Submission history

From: Claudia M. Raiteri [view email]
[v1] Wed, 6 Jul 2011 11:01:06 GMT (575kb)

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