



A multi-site ground-based search for Venus' lightning flashes

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The occurrence of lightning on Earth, Jupiter, Saturn, Uranus and Neptune is well accepted [1]. Lightning on Venus seems to be more elusive, and its occurrence remains controversial after a few decades of research. Past and current space missions have so far failed to report lightning flashes on the planet. It is thought, however, that the combination of dense clouds and vertical winds in Venus' mesosphere provides suitable conditions for the formation of intra-cloud lightning [2]. Lightning has played a key role in the fixation of N_2 into biologically available forms of nitrogen, a necessary step for the development of life on early Earth [3]. Lightning is still relevant in the formation of NO_x gas molecules in our planet's atmosphere. A clear-cut detection of lightning flashes on Venus would provide the first evidence for lightning on a terrestrial planet other than our own. Following in the steps of Hansell et al. [4], we have conducted narrowband fast imaging of the Venus disk from an array of ground-based telescopes. Our search has focused on the oxygen emission line at 777 nm that discharge and laser-excitation experiments have suggested as the most prominent emission line in CO_2/N_2 gas mixtures subjected to intense and quick deposition of energy. The dataset of already available observations spans the November 2010–January 2011 period and involves two sites (Calar Alto and Observatorio del Teide), and three instruments (AstraLux, FastCam and Wide FastCam) originally conceived for lucky imaging of astrophysical targets. Further observations with the 10.4-m Gran Telescopio Canarias from the Observatorio del Roque de los Muchachos (La Palma) are scheduled for early March. In the talk, we will summarize the analysis of the data and the conclusions drawn from this multi-site campaign.

Refs.: [1] Zarka et al., SSR, doi:10.1007/s11214-008-9366-8, 2008; [2] Takahashi et al., SSR, doi: 10.1007/s11214-008-9400-x, 2008; [3] Navarro-González et al., Nature, 412, 2001; [4] Hansell et al., Icarus, 117, 1995.