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SO_2 monitoring above Venus' clouds using VEx/SPICAV-UV nadir observations

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SO_2 in the upper atmosphere of Venus is an important tracer of (i) its recent (within 10 million years) geological activity, (ii) the chemistry and photo-chemistry of sulfur-bearing species, including H_2SO_4-H_2O underlying clouds and (iii) general circulation of the atmosphere bringing SO_2-rich air up to levels where photo-chemical destruction occurs.

The first monitoring, using *Pioneer Venus* and ground-based data, showed a two order-of-magnitude decrease from 1980 to 1995 [Esposito et al., 1988]. Latitudinal variations were also constrained in the early 1990s, and exhibited an increasing observable SO_2 column density with increasing latitude [Zasova et al., 1993; Na et al., 1994]. Measurements of SO_2 have resumed since 2006 mainly thanks to SPICAV/SOIR instrument on-board *Venus Express*, and first studies showed an opposite latitudinal gradient as well as relatively high SO_2 abundance, comparable to the early 1980s [Belyaev et al., 2008; Marcq et al., 2011].

Here we show the results for the 2007-2010 epoch, using an improved version of Marcq et al.'s (2011) model able to cope with non-nadir observations. Strong variability is observed within short (daily) timescales , but there is evidence for two distinct regimes, the most frequent being identical to the situation in 2006 already published (rather high abundances, negative latitudinal gradient), but starting in late 2009, a new regime very similar to the situation during the early 1990s (low abundances, positive latitudinal gradients) has been observed, alternating with the common regime within a few Earth months. Simple modeling suggests that fluctuations in the general circulation and/or sporadic change in SO_2 below 65 km may cause the alternation between both regimes.

Bibliography:

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