

## Short Comments from A. K. Georgoulas

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Since this interesting study is focused on the region of Mediterranean Basin and the authors do part of their analysis separately for the Western and Eastern part, I suggest that they should include the following paper in their citation list. To our knowledge this is the only paper dealing with tropospheric methane from satellites in the region.

Georgoulas, A.K., Kourtidis, K.A., Buchwitz, M., Schneising, O., Burrows, J.P.: A case study on the application of SCIAMACHY satellite methane measurements for regional studies: the Greater Area of Eastern Mediterranean, *Int. J. Remote Sens.*, 32(3), 787-813, doi:10.1080/01431161.2010.517791, 2011.

→ We were not aware about this paper. We thank Dr Georgoulas to send a short comment relevant to our discussion. The reference of the paper has indeed been inserted in the revised manuscript for three main reasons.

a) Indeed, this paper deals with tropospheric methane in the region of the Mediterranean Basin and a sentence has been inserted in the introduction.

Total columns of CH<sub>4</sub> as measured by SCIAMACHY over land and the Eastern Mediterranean from 2003 to 2004 show latitudinal and seasonal variations that cannot be attributed to volcano eruptions (Georgoulas et al., 2011).

b) The paper is also based on the SCIAMACHY measurements of CH<sub>4</sub> in the NIR domain above land. Thus, we have considered a sentence related to the capabilities of the NIR measurements, compared to the SWIR and TIR measurements (see replies to the reviewer #1's comments).

c) This paper finally presents some interesting results on CH<sub>4</sub> from space in the vicinity of the Mediterranean Sea, but only over land and essentially over the East of the Mediterranean. The paper states that the seasonal evolution of the total columns of CH<sub>4</sub> as measured by SCIAMACHY in 2003 and 2004 has an obvious maximum in August above the Greater Area of the Eastern Mediterranean. The authors do not deal with the interpretation of this maximum, that at least cannot be attributable to any eruptions from mud volcanoes. Being given that the sensitivity of the SCIAMACHY CH<sub>4</sub> total columns covers the vertical domain 1000-200 hPa from the vertical structure of the averaging kernels presented in Buchwitz et al. (2005), we note that 1) this maximum localized in August is consistent with our study, and 2) the impact of the Asian Monsoon Anticyclone on the CH<sub>4</sub> fields in the mid-to-upper troposphere cannot be ruled out. This point has been underlined in the discussion section.

One new paragraph has been inserted in the discussion section together with the reference to Buchwitz et al. (2005) and to Georgoulas et al. (2011).

Finally, Georgoulas et al. (2011) present some interesting results of CH<sub>4</sub> from space in the vicinity of the Mediterranean Sea, but only over land and essentially over

the Eastern Mediterranean. The authors found, from the total columns of CH<sub>4</sub> as measured by SCIAMACHY in 2003 and 2004, an obvious maximum in August that could not be attributed to any volcano eruptions although this area hosts a significant number of geological formations that could potentially contribute to the total CH<sub>4</sub> burden. Being given that the sensitivity of the SCIAMACHY CH<sub>4</sub> total columns covers the vertical domain 1000-200 hPa from the vertical structure of the averaging kernels presented in Buchwitz et al. (2005), we note that 1) this maximum localized in August is consistent with our study, and 2) the impact of the AMA on the CH<sub>4</sub> fields in the mid-to-upper troposphere cannot be ruled out.

Buchwitz, M., de Beek, R., Burrows, J. P., Bovensmann, H., Warneke, T., Notholt, J., Meirink, J. F., Goede, A. P. H., Bergamaschi, P., Körner, S., Heimann, M., and Schulz, A.: Atmospheric methane and carbon dioxide from SCIAMACHY satellite data: initial comparison with chemistry and transport models, *Atmos. Chem. Phys.*, 5, 941-962, doi:10.5194/acp-5-941-2005, 2005.

Georgoulas, A.K., Kourtidis, K.A., Buchwitz, M., Schneising, O., Burrows, J.P.: A case study on the application of SCIAMACHY satellite methane measurements for regional studies: the Greater Area of Eastern Mediterranean, *Int. J. Remote Sens.*, 32(3), 787-813, doi:10.1080/01431161.2010.517791, 2011.

In addition, it would be nice if the authors added in their discussion a number of ground-based studies that were conducted in the area. It has to be highlighted that the greater Mediterranean area hosts a significant number of geological formations that could potentially contribute to the total methane burden.

→ This point has been dealt in point c) above.