



Mapping the isotopic signature of methane in South-Eastern Spain: complementing biogeochemical long-term research with short term observations

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As a greenhouse gas, methane has a global warming potential of 25 in a 100 year scale. In order to establish mitigation plans it is important to assess its sources and sinks which can be both of geological and biological origin.

South-Eastern Spain is a region with many different possible methane sources: i) by seismic activity of many geological faults both inland and in the neighbouring marine region (i.e. the Carboneras fault crossing the Alborán Sea along Málaga coastline); ii) by seepage of methane from hydrates present in the marine regions close to the Gibraltar Strait and the Gulf of Cádiz; iii) by emissions from fossil fuels caused by high traffic of merchant ships and the presence of large harbours (Algeciras, Tetuan and Cádiz), and the Africa – Europe Gas Transport Network in the Gibraltar Strait region; iv) by organic matter decomposition in both highly productive marshlands and eutrophic reservoirs; v) by burning of agricultural debris for energy supply, mainly from olive residues.

In this study, a methane mapping survey has been conducted in the area around three atmospheric stations of the ClimaDat Atmospheric Network for Continuous Measurements of Greenhouse Gases (www.climadat.es) located in South-Eastern Spain (Sierra de Grazalema (SGC3), Tarifa (EEC3) and Sierra de Segura (SSC3).

A cavity ring down spectrometer (CRDS) (G2301m, Picarro®) installed on a car has been used to measure methane concentrations. Additionally, in selected points, air samples have been collected in Tedlar bags for isotopic signature analysis by CF-GC-IRMS (Continuous Flow Gas Chromatography-Isotope Ratio Mass Spectrometry).

In order to obtain a map facilitating the identification of the different methane sources in the background air at regional scale, the mapping of isotopic signature of methane together with its concentration is a useful tool to obtain fast and direct information that will contribute to the knowledge of methane transport at the regional scale and will be helpful in the validation of transport models.

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