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Methane emission measurements in a cattle grazed pasture: A comparison of four methods

Tiphaine Tallec (1,2), Katja Klumpp (2), Olivier Darsonville (2), Adrian Hensen (3), and Yvanne Rochette (4)

(1) Centre d'Etudes Spatiales de la BIOsphère (CESBIO), France, (2) INRA, UR 874 Grassland Ecosystem Research, Clermont Ferrand, France , (3) Energy Research Centre of the Netherlands (ECN), The Netherlands, (4) INRA, UR1213 Herbivores, Clermont-Ferrand-Theix-Lyon, France

Methane (CH4) is considered to be the second main contributor to the global greenhouse gas effect, with major CH4 emissions originating from livestock. Accurate measurements from ruminating herds are required to improve emission coefficients used in national emission inventories, and to evaluate mitigation strategies. Here we evaluated the reliability of eddy covariance technique (EC), for continuous CH4 measurements over a grazed field plot. Analyzer reliability of eddy covariance technique was tested against field scale measurements with the SF6 tracer technique [1], Gaussian plume model [2] and emission factors [3]. Results indicate a good agreement between methods. However, a systematic underestimation of EC data appeared when the distance between the source (ruminating heifers) and EC set-up (mast) was increased. A two-dimensional footprint density function allowed to correct for the dilution effect on measured CH4 and led to a good agreement with results based on the SF6 technique (on average 74 and 78 g CH4 head-1 day-1 (24 h) over the grazing experiment, respectively). Estimations of the CH4 budgets for the whole grazing season were in line with estimates (i.e. emission coefficients) based on feed intake and animal live weight as well as SF6 technique.