Geophysical Research Abstracts
Vol. 19, EGU2017-19633, 2017
EGU General Assembly 2017

More CH4 is emitted during the fallow than during the growing season in a Mediterranean rice agrosystems

Maite Martínez-Eixarch, Carles Ibàñez, Carles Alcaraz, Marc Viñas, Xavier Aranda, and J. Antonio Saldaña
IRTA (Institute of Agrifood Research and Technology) 43540 Sant Carles de la Ràpita, Spain.

Paddy rice fields are an important source of greenhouse gas emissions (GHG) as they contribute 5 to 20 % of the global anthropogenic CH4 emissions. The Ebre Delta (Catalonia, NE Spain) is one of the most important wetland complexes in the Western Mediterranean with 65 % of its area covered by rice fields.
The results herein presented assess the annual pattern of CH4 emissions from paddy rice in Ebre Delta, including the growing and fallow seasons as well as the major environmental variables modulating such emissions.
Fifteen rice fields covering the geo-physical variability of the Ebre Delta were selected for GHG monitoring. Common agronomic management was practiced: water direct-seeding, permanent flooding and moderate mineral fertilization during the growing season and straw incorporation, progressive drainage of the fields after the harvest. Fields are left fallow during the winter.
GHG were monthly sampled, from May to December in 2015. In each field, three closed chambers were used; from each of these, four gas samples were taken over a 30-minute period. Simultaneously, hydrological regime, soil physic-chemical parameters and plant cover were measured. GHG were analysed by gas chromatography. A Generalized linear model analysis (GLM) was performed to assess the most important influencing factors on CH4 emissions. An information-theoretic approach was used to find the best approximating models.
Overall, the CH4 emissions showed a bi-modal pattern, with peaks in July-August and in October. Emissions rates ranged from 2.1 $\pm$ 0.5 to 7.5 $\pm$ 1.4 mg C-CH4 m-2 h-1 in the growing season (May to September) and from 25.0 $\pm$ 5.7 to 20.1 $\pm$ 3.3 mg C-CH4 m-2 h-1 at post-harvest (October to December). In total, 314 kg C-CH4 ha-1 were emitted from Ebre Delta rice fields, of which 70 % during post-harvest. Larger off-season emissions were likely induced by straw incorporation.
The results of the GLM-IT analysis revealed that during the growing season, soil Eh and water level were the most important factors influencing CH4 emissions, followed by soil temperature and plant cover, with similar degree of importance. During the fallow season, soil redox and water level were also the most important factors, along with air temperature. Throughout the growing and fallow seasons, soil Eh was negatively related to CH4 emissions whereas temperature and plant cover positively. Interestingly, water level showed a contrasting effect on CH4 emissions: positive during the growing season and negative the fallow.
Traditionally, most of the research on GHG mitigation options in paddy rice has been focused on the rice growing period and less attention has been paid to the post-harvest season. The higher contribution of the fallow season to the total annual CH4 emissions evidenced in our study suggests that more effort should be made on this season when aiming at mitigating CH4 emissions, being water and straw management the key factors. Accordingly, we also recommend the inclusion of the fallow season for GHG inventories from paddy rice, usually neglected, to avoid CH4 emissions underestimations.