



Climate-driven increase of natural wetland methane emission offset by human-induced wetland reduction in China over the past three decades

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Both anthropogenic activities and climate change can affect the biogeochemical processes of natural wetland methanogenesis. Chinese natural wetlands vanished considerably during recent decades mainly due to human activities. Quantifying possible impacts of changing climate and wetland area on wetland methane (CH₄) emission in China is important for improving our knowledge on CH₄ budgets locally and globally. However, their respective and combined effects are uncertain. We incorporated changes in wetland area derived from remote sensing into a dynamic CH₄ model to quantify the human and climate change induced contributions to natural wetland CH₄ emission in China over the past three decades. Here we found that human-induced wetland loss contributed 34.3% to the CH₄ emission reduction (0.92 TgCH₄), and climate change contributed 20.4% to the CH₄ emission increase (0.31 TgCH₄), suggesting that decreasing CH₄ emission due to human-induced wetland reductions has offset the increasing climate-driven CH₄ emission. With climate change only, temperature was a dominant controlling factor for wetland CH₄ emission in the northeast (high latitude) and Qinghai-Tibet Plateau (high altitude) regions, whereas precipitation had a considerable influence in relative arid north China. Overall, ignoring human-induced wetlands dynamics may result in great uncertainties in quantifying global wetland CH₄ emission.