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Pesticides in soil and sediment of a dyke-protected area of the Red River Delta, Vietnam

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Coastal regions are densely populated but at the same time represent important agricultural areas for food production of the growing world population. To sustain high agricultural yields, in monocultures such as permanent rice systems, pesticides are used in high quantity and frequency. While earlier studies monitored the fate of pesticides in paddy rice systems, the overall fate of these compounds is altered nowadays due to the construction of dykes, which are needed in many delta regions to protect them from high tides, storm surges and salt water intrusion such as in the Red River Delta. The dyke system regulates the discharge and water exchange inside the diked area including irrigation channels for the paddy rice production. Local authorities observed increasing pollution towards the sea (highest pollution close to the dykes) and hypothesized that the dyke system would prevent water exchange and thus lead to an accumulation of pollutants within the diked area. Hence, the purpose of this study was to investigate the effect of dykes on pesticide pollution patterns in coastal delta regions of the Red River Delta. The study was conducted in the district Giao Thuy of the Red River Delta, Vietnam. This area is surrounded by a sea and river dyke; both have several inlet and outlet gates to control the water level in the irrigation channels. We determined the pesticide pollution pattern in a diked agricultural area, as well as along salinity gradients in and outside the diked areas. Samples were taken from rice fields and sediments from irrigation channels inside the diked area as well from saline aquaculture fields located outside the dyke. Pesticide analysis was conducted by accelerated solvent extraction (ASE), followed up by the clean-up process described by Laabs et al. (2007) and analyses using gas chromatography coupled with a mass selective detector (MSD). Preliminary results suggest that out of the 26 analysed compounds chlorpyrifos, propiconazole and isoprothiolane occurred frequently in samples taken from rice fields. Pesticide concentrations were not higher in rice field closer to the dykes. Pesticide concentrations within paddy fields are likely driven by pesticide inputs on site. However, pattern in canal sediment samples is more likely de-coupled from on-site applications. Results will be discussed in relation to adaptation to increasing salinity intrusion in coastal areas.