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Modelling atmospheric fate of TiO_2 and its impact on atmospheric chemistry

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TiO_2 is used as an engineered nanomaterial in paints, and used with the purpose to photocatalytically reduce NO_2 concentrations on street level. During production and use phase of this material, a small part of it may be released into air as ultrafine particles and form a potential environmental risk. In the EU-funded NanoFASE project the fate of engineered nanomaterials during the entire life cycle is investigated. Emission to air, atmospheric transformation, impact on atmospheric chemistry and deposition to the surface are investigated and are coupled to fate of nanoparticles in soil and water systems. The ultimate goal of the project is to develop a framework for regulations for such species, along the lines of REACH. Knowledge gaps for the atmosphere are in particular the release forms and rates, impact on atmospheric chemistry, and removal efficiencies which affect transport distances. We will present the case for TiO_2 in the atmospheric environment, including release estimates, laboratory measurements on chemical impacts, and model results on European scale with the LOTOS-EUROS model. The deposition output is used as an input to soil and water models. Although release amounts, concentrations, impact on atmospheric chemistry and deposition were found to be low, the study comprehensively provides the first spatially-resolved results at European scale. The results if the study will be presented and all assumptions that had to be made to come to a result explicitly addressed.