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Wetland chronosequence as a model of peatland development: Vegetation succession, peat and carbon accumulation

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A land uplift coast with ongoing primary peatland formation was used as a setting to study the patterns of peatland development. We compared a chronosequence of peatlands with vertical peat sequences and evaluated the Holocene Peatland Model (HPM) simulation against the field observations. The current vegetation assemblages, from the emergent sea shore to a 3000 year old bog, have formed a continuum from minerotrophic to ombrotrophic plant communities where the distribution of plant functional types was related to peat thickness and water table depth. A similar sequence of plant communities was found in the historical vegetation data, which supported the use of the chronosequence as peatland development model. Palaeobotanical evidence from the oldest site showed a rapid and quite recent fen-bog transition, indicated by a coincidental decrease in minerotrophic plant functional types and an increase in ombrotrophic plant functional types. The long term mean rate of carbon (C) accumulation varied from 2 to 34 g C m^{-2} y^{-1}, being highest in the intermediate age cohorts. Mean nitrogen (N) accumulation varied from 0.1 to 3.9 g N m^{-2} y^{-1} being highest in the youngest sites. Water table (WTD) was deepest and temporally least variable in the oldest sites, although spatial variation in WTD was largest in these sites. Evaluation of the HPM simulations against the field observations indicated that the model is adjustable and able to produce reasonable predictions.