BALTEX Survey on

Biogeochemical Modelling Activities in the Baltic Sea Basin

Model Name	CoastMab
Model Description	This is a general, process-based mass-balance model for total phosphorus (TP), toxins (radionuclides, metals and organics) and suspended particulate matter (SPM) in coastal areas (the ecosystem scale) and related models for toxind in fish, chlorphyll-a concentrations, secchi depth (a meassure of water clarity), oxygen saturation in the deep-water zone, sedimentation, etc. The model is based on ordinary differential equations and calculates inflow, outflow and internal fluxes on a monthly basis. It consists of four compartments: surface water, deep water, erosion/transportation areas for fine sediments and accumulation areas for fine sediments. The separation between surface water and deep water is not done from water temperature, but from sedimentological criteria (from the theoretical wave base). There are algorithms for all major internal TP-fluxes (sedimentation, resuspension, diffusion, mixing and burial). Validations have been made using data from different coastal areas. The results show, for example, that the model predicts monthly TP in water and chlorophyll-a very well (generally within the uncertainty bands of the empirical data). The model has also been tested with sensitivity tests, which show that the most important factor regulating model predictions is generally the concentration in the sea outside the coast. The model is simple to apply since all driving variables may be accessed from maps or monitoring programs. The driving variables include coastal area, section area (between the defined coastal area and the adjacent sea), mean and maximum depths, latitude (to predict water temperatures, stratification and mixing), salinity and concentration in the sea. Many of the model structures are general and could be used for areas other than those included in this study, e.g., for open coasts, estuaries or tidal coasts and also for other substances than phosphorus.
State Variables	Do you mean obligatory driving variables, target variables for model predictions, model constants, or coast-specific variables needed to run the model in a specific coastal area?
On a scale between 1 and 10, please classify your model Classify – how? Predictivte power, practical utility, or what. I enclose some	1 Biogeochemical cycling, matter fluxes 2 3 4 5 6 7 8 9

papers descrbing the model	10 Ecosystem functioning
Dimension (0D, 1D, 2D, 3D)	ODE
Modeled Area (Marine, terrestial, combined)	Catchments and coastal areas (and also rivers and lakes)
Coupled to hydrological component	Yes, mainly river discharge and water exchange to and from coastal areas
Suited for climate change sensitivity studies	Yes
Publications	Selected books: Håkanson, L., 1999. Water pollution - methods and criteria to rank, model and remediate chemical threats to aquatic ecosystems. - Backhuys Publishers, Leiden, 299 p. Håkanson, L., 2000. Modelling radiocesiumm in lakes and coastal areas - new approaches for ecosystem modellers. A textbook with Internet support. - Kluwer Academic Publishers, Dordrecht, 215 p. Håkanson, L. and Boulion, V., 2002. The Lake Foodweb - modelling predation and abiotic/biotic interactions. – Backhuys Publishers, Leiden, 344 p. Håkanson, L., 2006. Suspended particulate matter in lakes, rivers and marine systems. - Blackburn Press, New Jersey, 331 p. Selected international papers: Håkanson, L., 2003. Propagation and analysis of uncertainty in ecosystem models. - In: Canham, C.D., Cole, J.J. and Lauenroth, W.K. (eds.), Models in ecosystem science, Princeton Univ. Press, Princeton, U.S.A., pp. 139-167. Håkanson, L., 2004. Break-through in predictive modelling opens new possibilities for aquatic ecology and management – a review. – Hydrobiologia, 518: 135-157. Håkanson, L., 2005. A new general dynamic model predicting radionuclide concentrations and fluxes in coastal areas from readily accessible driving variables. - J. Env. Radioactivity, 78: 217-245. Håkanson, L. and Gyllenhammar, A., 2005. Setting fish quotas based on holistic ecosystem modelling including environmental factors and foodweb interactions – a new approach. – Aquatic Ecology, 39: 325-351. Håkanson, L., 2006. A dynamic model for suspended particulate matter (SPM) in rivers. – Global Ecol. Biogeogr., 15:93-107. Håkanson, L. and Eklund, J.M., 2006. A dynamic mass-balance model for phosphorus fluxes and concentrations in coastal areas. Ecol Res. (in press). Håkanson, L., 2006. A revised dynamic model for suspended particulate matter (SPM) in coastal areas. - Aquat. Geochem. (in press).
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Remarks