Model Entry form

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| ***General Information*** | |
| Acronym of the model: | DY |
| Full name of the model: | DYnamic REservoir Simulation Model |
| Model components: | Hydrodynamics  Chemistry  Biology |
| Supported platforms: | Windows  Mac  Linux |
| Programming languages: | Fortran 95 |
| Still maintained: | Yes, by …..  No |
| Most recent version | *not known* |
| ***Model Structure and Spatial Domain*** | |
| Needs compilation  Executables are available | |
| 0D  1D  2D (horizontal)  2D (vertical)  3D | |
| Flexible grid  Fixed grid Other: | |
| Mass balance included  Catchment model | |
| ***Model Description*** | |
| Model Objective: | simulate temperature stratification in lakes and reservoirs |
| Specific application:  *(Please include example(s))* | * Lake destratification (Schladow 1993) * Introduction of new mixing algorithm (benthic boundary layer) (Yeates & Imberger 2003) * Simulate thermal structure in Lake Kinneret, validation of code re-write (Gal et al. 2003) * Comparison of one-dimensional hydrodynamic models (Perroud et al., 2009) * Simulation of meromictic lakes, coupling with geochemical model CORE (Moreira et al. 2011) |
| Background knowledge needed to run model: | * Knowledge on physical processes in lakes * some programing language to handle input/output files, e.g., R, python or Matlab |
| Basic procedures:  (*Describe the procedure step-by-step*) | 1. Prepare the input files (bathymetry, meteorology, inflow, outflow, initial profile) 2. Set the simulation settings (simulation start, min/max layer thickness, etc.) 3. Run the dycd.exe 4. Compare results with measurements 5. (optional: Adapt parameters, e.g. mixing parameters, layer thickness, extinction coefficient) |
| *Here you can add a more detailed description of the model here (up to 250 words)*:  DYRESM is a one-dimensional hydrodynamic model that was developed to simulate temperature stratification in lakes and reservoirs. It has been applied to many lakes and reservoirs across the globe and served for management purposes. DYRESM can be coupled with the biogeochemical model CAEDYM.  It is possible to include artificial mixing into the simulation. | |
| Link to website(s) and/or manual: | NA |
| ***Model Characteristics*** | |
| Input variables: | *Obligatory*:   * Bathymetry (area [m2] vs. depth [m]; zero height elevation [m]; crest elevation [m]; elevation of outflows [m]; inflow angle and slope) [degrees]; file \*.stg * Meteorological forcing: wind speed [m/s], shortwave radiation [W/m2], longwave radiation [W/m2] or cloud cover [decimal fraction], air temperature [°C], vapour pressure [mbar], rain [m]); file \*.met * Inflow data: volume [m3/day], water temperature [deg C], salinity [PSU], file \*.inf * Outflow data: volume [m^3/day], file \*.wdr * Initial profile: elevation [m], water temperature [deg C], salinity [PSU]; file \*.pro * Model configuration: start day, simulation length, average extinction coefficient, time step [s], output interval [days]; file \*.cfg * Model parameter: mixing parameter + a few physical parameter; file \*.par |
| *Optional*: |
| Input file format: | ASCII  .netcdf  .csv  .xls  Other, namely: |
| Output variables: | water temperature, salinity, density, water level (via height of layers) |
| Output file format | ASCII  .netcdf  .csv  .xls  Other, namely: |
| Biogeochemical model components:  (*Which nutrients, phytoplankton, zooplankton, etc., including number of different groups*) | NA |
| Model structure/mathematical framework (e.g., ODE, PDE, empirical model,...) | PDE |
| Temporal resolution:  (*minimal and maximal)* | hourly to daily |
| Minimal spatial resolution: |  |
| Variables needing calibration: | * Extinction coefficient * Probably it needs a wind factor (change wind input) * Optional: mixing parameters (eta\_K, eta\_P, eta\_S) |
| Has successfully been used in:  (*e.g. Climate change scenarios, lake management support, etc. Please provide a reference*) | |
| Climate Change Scenario | Robertson & Ragotzkie, 1990; Bayer et al. 2013; |
| Shallow Lake/Reservoir |  |
| Deep Lake/Reservoir | Gal et al. 2003 |
| Oligotrophic Water |  |
| Mesotrophic Water |  |
| Eutrophic Water |  |
| Ocean |  |
| Management Support |  |
| ... |  |
| Countries in which the model has been applied | Australia, Denmark, Israel, Germany, New Zealand, USA |
| Which Institutes have applied the model | CWR, University of Waikato, Kinneret Limnological Institute, University of Konstanz, Helmholtz Centre for Environmental Research – UFZ, … |
| Has coding for: | |
| Ice dynamics  Sediment heat flux  Sediment dynamics  ...  Internal waves  ... | |
| ***Accessibility*** | |
| Open-Source  Open-to-Use  Licensed | |
| Prompt-based  GUI | |
| Test cases available | |
| Available tools for pre- and post-processing: | there used to be some matlab scripts |
| Support:  (*Community forum, mailing list, “help”-manual, contact, etc.)* | no official support anymore |
| Can be coupled to the following models: | CAEDYM |
| How can someone get access to this model:  (*Please provide a URL or contact person*) | NA |
| ***Miscellaneous*** | |
| *Comments (things not covered by the form):* | |
| *Useful tricks and hints for other users (on handling input files, running the model, numerics,...):* | |
| Links (*Please add links to the model’s developer’s website and the model’s resources, like forums, manuals, support, contact,...*): | |
| *Reference list (Please add several references in which the model has been applied*):   * Imberger, J. and Patterson, J.C., 1981. A dynamic reservoir simulation model-DYRESM. In: H.B. Fischer (ed.), Transport models for inland and coastal waters, Academic Press, 1980, 310 – 36 * Robertson, D.M. and Ragotzkie, R.A., 1990. Changes in the thermal structure of moderate to large sized lakes in response to changes in air temperature. *Aquatic Sciences*, *52*(4), pp.360-380. * Schladow, S.G., 1993. Lake destratification by bubble-plume systems: Design methodology. *Journal of Hydraulic Engineering*, *119*(3), pp.350-368. * De Stasio Jr, B.T., Hill, D.K., Kleinhans, J.M., Nibbelink, N.P. and Magnuson, J.J., 1996. Potential effects of global climate change on small north‐temperate lakes: physics, fish, and plankton. *Limnology and Oceanography*, *41*(5), pp.1136-1149. * Romero, J. and Melack, J.M. (1996). “Sensitivity of Vertical Mixing in a Large Saline Lake to Variation in Runoff”, Limnol. 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| Form was updated (YYYY-MM-DD) | 2018-10-22 |

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