Auxiliary material for

Data set for hydrodynamic lake model calibration: A deep prealpine case

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1. Introduction

This data set contains the measurements that were collected in Lake Iseo from 1995 to 2012. This data set provides the main information needed for the calibration of lakes dynamic models: the meteorological forcing acting on the lake surface, the physical properties of the inflows and outflow, and the main physical and chemical parameters of the lake water column. The data set is made up of two different subset: (i) a well-resolved, complete and high-resolution one, covering the period 06/2011 to 06/2012 and comprising the data collected by an on-lake floating station equipped with a thermistor chain, and (ii) the historical time series 1995-2012, made up of data collected during monthly sampling of the lake water and by some shore stations.

2. Files description

2.1 Bathymetry files

2.1.1 *iseo_bathymetry.txt*

Description:	Lake Iseo bathymetry
Content:	Depth Y (m) above the lake surface
Notes:	ASCII grid format file that can be opened with a text editor. Data are averaged over a 20mx20m grid. Small areas close to the coastline having Y< 1m are not covered. The lower left corner metric coordinates are in the Italian Gauss-Boaga system.

2.1.2 *iseo_coastline.shp; iseo_coastline.dbf; iseo_coastline.shx*

Description:	Lake Iseo coast line
Content:	East and north coordinates (m) of the coast line in the Italian Gauss-Boaga system.
Notes:	Shapefile that can be opened with a geographic information system software (e.g. ArcGIS), comprising also the limited areas having depths Y< 1 m.

2.2 Lake water data

2.2.1 ***S1.txt***

Description:	Water properties of the lake water column measured at 13 depths between 0 and 250 m.
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Columns “WaterTemp”, temperature of the lake water, °C, S1 location. Columns “DO”, oxygen content of the lake water, mg l^{-1}, S1 location. Columns “Cond”, conductivity of the inflowing, µS cm^{-1}, S1 location. Columns “SecchiDepth”, Secchi depth, m, S1 location.
Resolution:	Monthly data
Record length:	1995-2012
Notes:	Text file that can be opened with a text editor. Temperature, oxygen and conductivity data are referred to the depths indicated in the headers (e.g. WaterTemp(°C)_5m is the temperature at 5 m of depth). Conductivity is reported as electrical conductivity at a reference temperature of 25 °C. NaN stands for *data unavailable*.

2.2.2 ***LDS.txt***

Description:	Water properties of the lake water column measured between 0 and 50 m.
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Columns “WaterTemp”, temperature of the lake water, °C, LDS location.
Resolution:	Hourly-averaged data
Record length:	2011-2012
Notes:	Text file that can be opened with a text editor. Temperature data are referred to the depths indicated in the headers (e.g. WaterTemp(°C)_1.3m is the temperature at 1.3 m of depth). NaN stands for *data unavailable*.

2.2.3 ***TC.txt***

Description:	Water properties of the lake water column measured between 4 and 36 m.
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Column “DepthSensor1”, depth of the upper sensor, m, TC location (D1). Columns “WaterTemp”, temperature of the lake water, °C, TC location.
Resolution:	Hourly-averaged data
Record length:	07/2011 - 10/2011
Notes:	Text file that can be opened with a text editor. Temperature data are referred to the sensor indicated in the headers. In particular, the headers indicates the distance (D2) of each sensor from the upper sensor. Hence, the depth of each sensor must be calculated at each time as the sum of D1 and D2.

2.3 Inflows and outflows data

2.3.1 ***Discharges_and_level.txt***

Description:	Measured discharges and level of the lake surface.
Data:	Columns "Year" "Month" "Day" "Hour" "Minute" "Second", time. Column "RL3", outflowing discharge, $m^3 s^{-1}$, RL3 location. Column "RL1", inflowing discharge, $m^3 s^{-1}$, RL1 location (Oglio River). Column "RL2", inflowing discharge, $m^3 s^{-1}$, RL2 location (Industrial Canal). Column "WaterLevel", level of the lake surface, meters above sea level, RL3 location.
Resolution:	Daily-averaged data
Record length:	1995-2012
Notes:	Text file that can be opened with a text editor.

2.3.2 ***RL1.txt***

Description:	Measured RL1(Oglio River) temperature and conductivity data.
Data:	Columns "Year" "Month" "Day" "Hour" "Minute" "Second", time. Column "WaterTemp", temperature of the inflowing water, °C, RL1 location. Column "Cond", conductivity of the inflowing water, $\mu S\ cm^{-1}$, RL1 location.
Resolution:	Hourly-averaged data (*except for some additional sparse conductivity data that were collected once every 15 days on average)
Record length:	2009-2012 for temperature and 2011-2012 for conductivity (*with some additional sparse conductivity data that were collected between 06/1995-05/2007 and 01/2000-12/2000)
Notes:	Text file that can be opened with a text editor. Conductivity is reported as electrical conductivity at a reference temperature of 25 °C. NaN stands for *data unavailable*.

2.3.3 ***RL2.txt***

Description:	Measured RL2 (Industrial Canal) temperature and conductivity data.
Data:	Columns "Year" "Month" "Day" "Hour" "Minute" "Second", time. Column "WaterTemp", temperature of the inflowing water, °C, RL1 location. Column "Cond", conductivity of the inflowing water, $\mu S\ cm^{-1}$, RL1 location.
Resolution:	Hourly-averaged data (*except for some additional sparse conductivity data that were collected once every 15 days on average)
Record length:	2009-2012 for temperature and 2011-2012 for conductivity (*with some additional sparse conductivity data that were collected between 06/1995-05/2007 and 01/2000-12/2000)
Notes:	Text file that can be opened with a text editor. Conductivity is reported as electrical conductivity at a reference temperature of 25 °C. NaN stands for *data unavailable*. The increase in temperature in August are due to the fact that no discharge is diverted in the Industrial Canal in this period of the year (see the discharge values in the Discharges_and_level.txt file). When 0 $m^3 s^{-1}$

is measured in RL2, RL2 temperature and conductivity must be referred to the stagnant water in the Industrial Canal. This explains why they are exceptionally high.

2.3.4 ***RL3.txt***

Description:	Measured RL3 (Oglio River) temperature data.
Data:	Columns "Year" "Month" "Day" "Hour" "Minute" "Second", time. Column "WaterTemp", temperature of the outflowing water, °C, RL3 location.
Resolution:	Hourly-averaged data
Record length:	2005-2012
Notes:	Text file that can be opened with a text editor.

2.3.5 ***RL1star.txt***

Description:	Estimated RL1 (Oglio River) temperature data.
Data:	Columns "Year" "Month" "Day" "Hour" "Minute" "Second", time. Column "WaterTemp*", estimated temperature of the inflowing water, °C, RL1 location.
Resolution:	Daily data
Record length:	1995-2012
Notes:	Text file that can be opened with a text editor. These data were estimated from daily-averaged air temperature on the basis of the procedure explained in the section 2.5.3 of the paper. To distinguish between these data and the measured ones, the variable's name has been marked with * in the headline.

2.3.6 ***RL2star.txt***

Description:	Estimated RL2 (Industrial Canal) temperature data.
Data:	Columns "Year" "Month" "Day" "Hour" "Minute" "Second", time. Column "WaterTemp*", estimated temperature of the inflowing water, °C, RL2 location.
Resolution:	Daily data
Record length:	1995-2012
Notes:	Text file that can be opened with a text editor. These data were estimated from daily-averaged air temperature on the basis of the procedure explained in the section 2.5.3 of the paper. To distinguish between these data and the measured ones, the variable's name has been marked with * in the headline.

2.4 Meteorological data

2.4.1 ***WS1.txt***

Description:	Meteorological data measured at WS1.
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Column “AirTemp”, air temperature, °C, WS1 location. Column “AirPres”, air pressure, mbar, WS1 location. Column “WindSpeed”, wind speed, m s^{-1}, WS1 location. Column “WindDir”, wind direction, °, WS1 location.
Resolution:	Hourly-averaged data
Record length:	2010-2012
Notes:	Text file that can be opened with a text editor. NaN stands for *data unavailable*. “WindDir” indicates the direction from which the wind is blowing.

2.4.2 ***WS2.txt***

Description:	Meteorological data measured at WS2.
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Column “AirPres”, air pressure, mbar, WS2 location. Column “WindSpeed”, wind speed, m s^{-1}, WS2 location. Column “WindDir”, wind direction, °, WS2 location.
Resolution:	Hourly-averaged data
Record length:	2010-2012
Notes:	Text file that can be opened with a text editor. NaN stands for *data unavailable*. “WindDir” indicates the direction from which the wind is blowing.

2.4.3 ***LDS.txt***

Description:	Meteorological data measured at LDS.
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Column “AirTemp”, air temperature, °C, LDS location. Column “WindSpeed”, wind speed, m s^{-1}, LDS location. Column “WindDir”, wind direction, °, LDS location. Column “HumRel”, relative humidity, %, LDS location. Column “ShortWaveRad”, short wave radiation, W m^{-2}, LDS location. Column “NetRad”, net total radiation, W m^{-2}, LDS location.
Resolution:	Hourly-averaged data
Record length:	2011-2012
Notes:	Text file that can be opened with a text editor. NaN stands for *data unavailable*. The meteorological instruments are located 2.5 m above the lake surface. “WindDir” indicates the direction from which the wind is blowing.

2.4.4 *LS.txt*

Description:	Meteorological parameters measured/derived from the land-based data
Data:	Columns “Year” “Month” “Day” “Hour” “Minute” “Second”, time. Column “AirTemp”, air temperature, °C, LS1 location. Column “HumRel”, relative humidity, %, LS1 location. Column “Rain”, rain, mm, LS1 location. Column “WindSpeed_LS1”, wind speed, m s^{-1}, LS1 location. Column “WindDir_LS1”, wind direction, °, LS1 location. Column “WindSpeed_LS2”, wind speed, m s^{-1}, LS2 location. Column “WindDir_LS2”, wind direction, °, LS2 location. Column “WindSpeed*”, modified wind speed, m s^{-1}, representative of on-lake conditions. Column “ShortWaveRad”, short wave radiation, W m^{-2}, LS1 location. Column “LongWaveRad_in*”, estimated incoming long wave radiation, W m^{-2}.
Resolution:	Hourly-averaged data
Record length:	1995-2012
Notes:	Text file that can be opened with a text editor. NaN stands for *data unavailable*. Variables that were not directly measured are marked by a * in the headline. The file includes both the original time series of the wind speed and direction measured at the two stations LS1 and LS2, and the modified wind intensities WindSpeed*. WindSpeed* that are representative of on-lake conditions (see section 2.5.2 of the paper for details). We strongly suggest to use this WindSpeed* variable for hydrodynamic modeling purposes. “WindDir” indicates the direction from which the wind is blowing. LS2 wind direction is provided with an accuracy of 45°. LongWaveRad_in* has been estimated from hourly-average air temperature and air cloud cover fraction (see section 2.5.1 of the paper for details).