Piso.AI uses a machine learning framework to predict/reconstruct the hydrogen and oxygen isotopic composition of precipitation for specific months and years in the past using available and regularly updated gridded climate data products and location variables. The model was trained using precipitation isotope data available from the Global Network of Isotopes in Precipitation (GNIP). The details of the approach are outlined in the original publication. If you use Piso.AI for your work (publications, oral/poster presentations, etc.), we ask that you cite:

Nelson, D.B., Basler, D., Kahmen, A. (2021). "Precipitation Isotope Time Series Predictions from Machine Learning Applied in Europe." Proceedings of the National Academy of Sciences of the United States of America, Vol. 118 No. 26 e2024107118.

Piso.AI is intended to be regularly updated as the input climate data that are used are updated with each passing year. The yearly updates do not change the selection of input variables or the model structures that are used to reconstruct the oxygen and hydrogen isotope values. Predictions for past time points that are made will only differ from one yearly update to the next if the input climate variables change, for example, due to updated interpolation schemes used by the original data providers. Yearly updates of Piso.AI are indicated by an updated year following the version number. The original publication used data through the end of 2019, and was called Piso.AI v.1.01. The first update to include predictions for a new year, 2020, is called Piso.AI v.1.2020. Any changes to the model structure that may be implemented in the future to improve the accuracy of prediction, such as the inclusion of new predictor variables, or retraining the models with new input data, will be marked by a new version number (i.e., Piso.AI v.X). Versions of Piso.AI that predate the original publication are now retroactively renamed Piso.AI v.0.9 (previously available on the Piso.AI site prior to September, 2020), and Piso.AI v.0.01 (previously available on the Piso.AI site prior to March, 2021).

Additional models using the Piso.AI framework may also be introduced, but these are identified with a new name. The first such expansion is Piso.AI.eur1900. This model uses a similar spatial domain as the original Piso.AI, but uses a more limited selection of predictor variables that allows reconstructions of precipitation oxygen and hydrogen isotope values to be made further into the past. This comes at the expense of slightly reduced accuracy, Piso.AI.eur1900 v.1.2020 currently covers the time period from 1901-2020. For more information on this application please see:□□https://isotope.bot.unibas.ch/PisoAI-eur1900-v1-2020/

Model versions and data updates:

Piso.AI v.1.2020 (released Dec-2021) predictor variables:

- Climate Research Unit (CRU) time-series data v.4.05
- European Observations gridded datasets (E-OBS) v.23.1e
- National Centre for Environmental Prediction (NCEP/NCAR) Reanalysis 1 project data (inclusive of 2020)
- Teleconnection index time series data obtained from the Climate Prediction Centre (inclusive of 2020)

Piso.AI v.1.01 (version in original publication) predictor variables:

- Climate Research Unit (CRU) time-series data v.4.04

- European Observations gridded datasets (E-OBS) v.21.0
- National Centre for Environmental Prediction (NCEP/NCAR) Reanalysis 1 project data (inclusive of 2019)
- Teleconnection index time series data obtained from the Climate Prediction Centre (inclusive of 2019)
- Archived version accessible at: https://isotope.bot.unibas.ch/PisoAI-v1-01/

Data sources:

Global Network of Isotopes in Precipitation (GNIP):
IAEA/WMO, Global Network of Isotopes in Precipitation. GNIP Database, Accessible at: http://www.iaea.org/water (2020).

Climate Research Unit (CRU) time-series data:
I. Harris, T. J. Osborn, P. Jones, D. Lister, Version 4 of the CRU TS monthly high-resolution gridded multivariate climate dataset. Sci. Data 7, 109 (2020).

European Observations gridded datasets (E-OBS):
R. C. Cornes, G. van der Schrier, E. J. M. van den Besselaar, P. D. Jones, An Ensemble Version of the E-OBS Temperature and Precipitation Data Sets. J. Geophys. Res. Atmos. (2018) https:/doi.org/10.1029/2017JD028200.

National Centre for Environmental Prediction (NCEP/NCAR) Reanalysis 1 project data:
E. Kalnay, et al., The NCEP/NCAR 40-year reanalysis project. Bull. Am. Meteorol. Soc. (1996) https:/doi.org/10.1175/1520-0477(1996)077<0437:TNYRP>2.0.CO;2.

Teleconnection index time series data obtained from the Climate Prediction Centre:
A. G. Barnston, R. E. Livezey, Classification, seasonality and persistence of low-frequency atmospheric circulation patterns. Mon. Weather Rev. 115, 1083–1126 (1987).

J. M. Wallace, D. S. Gutzler, Teleconnections in the geopotential height field during the Northern Hemisphere winter. Mon. Weather Rev. 109, 784–812 (1981).