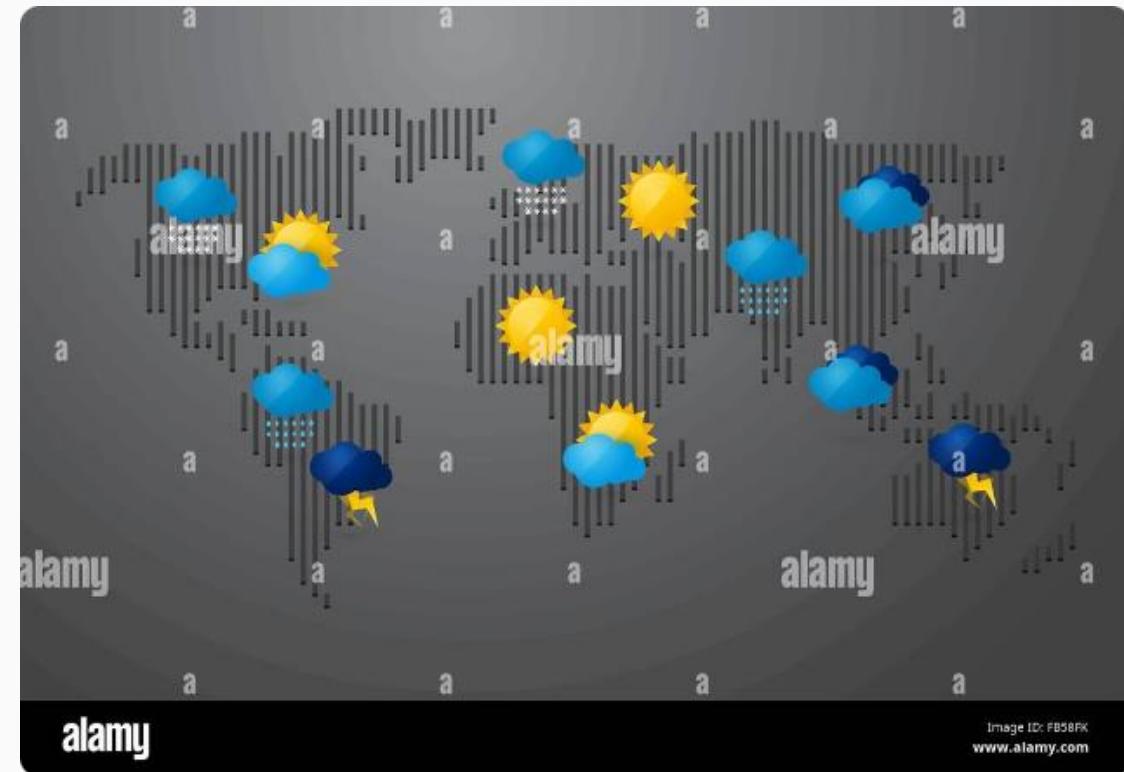
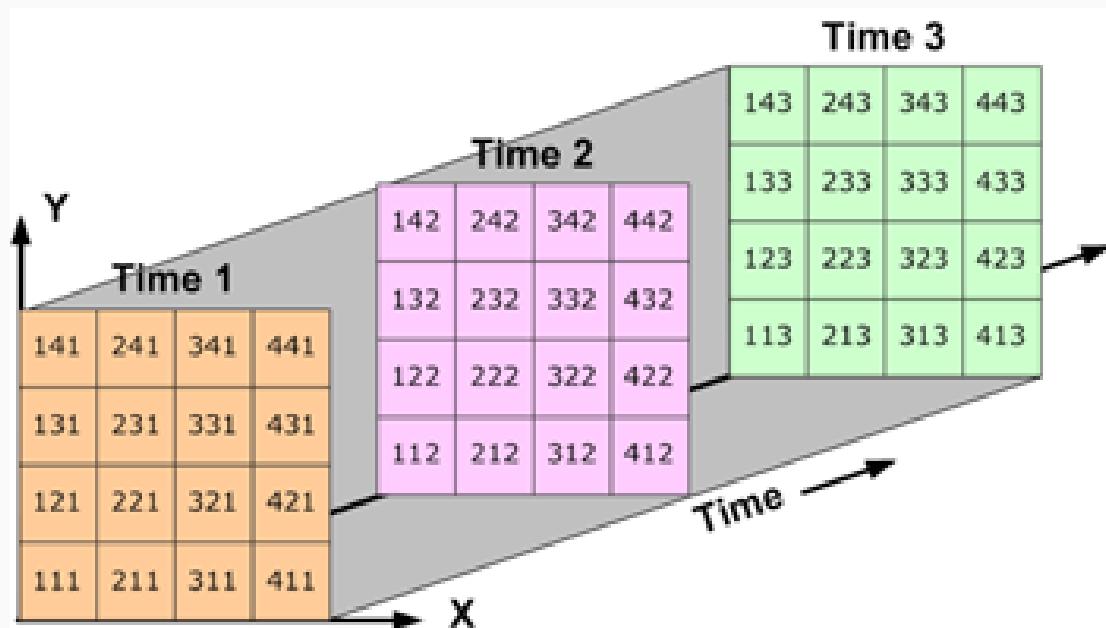


Time Series Analysis using Python



Sukant Jain,
Scientist C
National Institute of Hydrology,
Roorkee
sukant.nihr@gov.in

Gridded Format for Storing Climate Data



What is Gridded Data?

Definition

Gridded data organizes spatial and temporal information into a structured grid, where each cell represents a specific location or time interval.

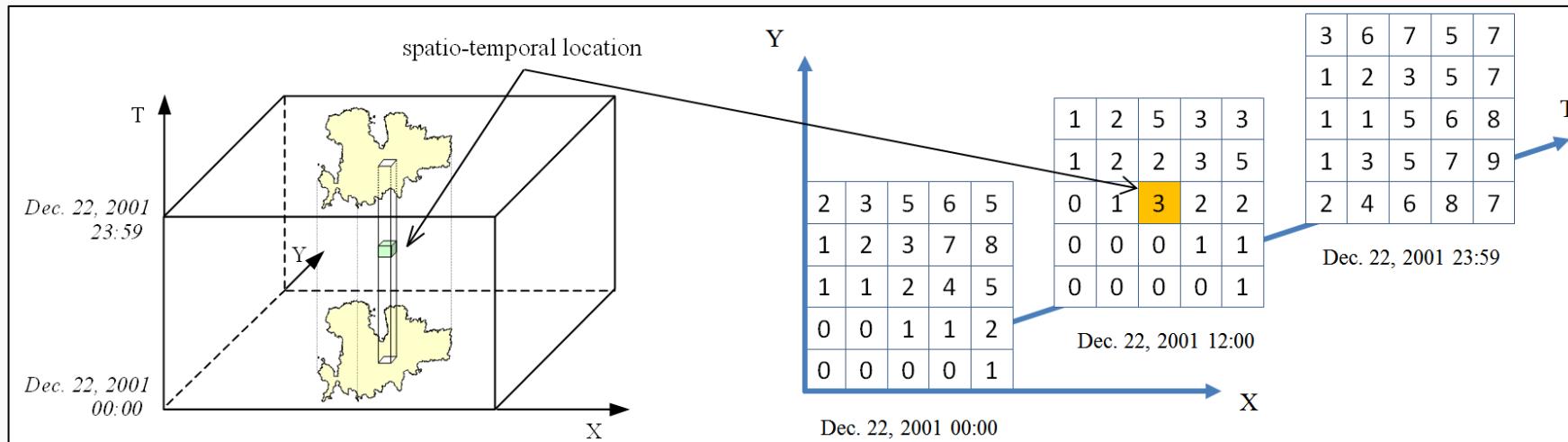
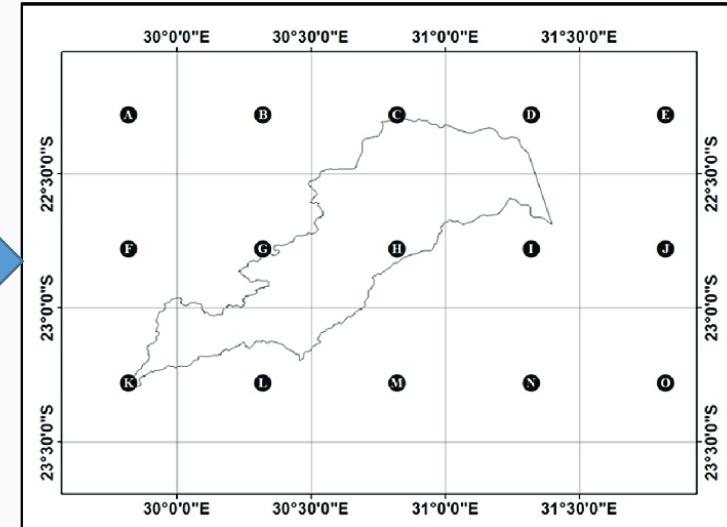
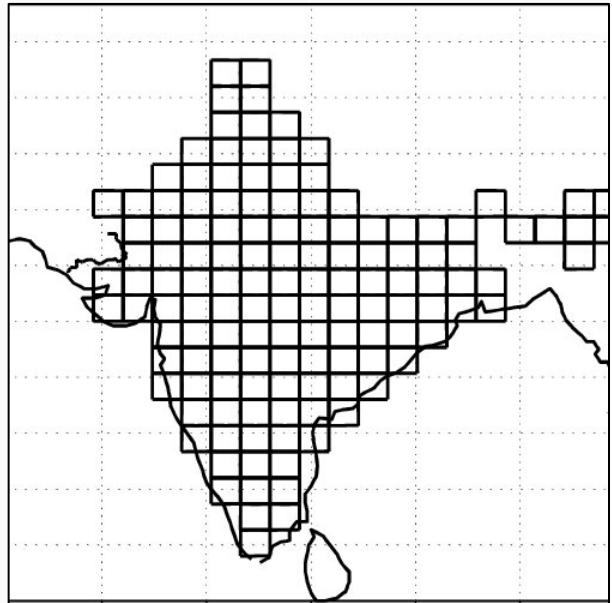
Structure

Each cell in the grid contains data values such as temperature, precipitation, or wind speed, providing a comprehensive representation of environmental conditions.

Applications

Gridded data is widely used in climate modeling, weather forecasting, and environmental monitoring, providing valuable insights into climate change and its impacts.

What is Gridded Data?



Efficiency of Gridded Data Storage

CSV Files

CSV files are simple and easy to use, but they suffer from data redundancy, large file sizes, and slow access times, making them inefficient for storing large datasets.

Gridded Data Formats

Gridded data formats are designed for efficient storage, reducing redundancy and enabling faster access times. They are well-suited for handling massive datasets.

Advantages

Gridded data formats provide improved data organization, efficient storage, reduced redundancy, and enhanced accessibility, making them ideal for large-scale climate data analysis.

Disadvantages

Specialized software is required to access and manipulate data in gridded formats, necessitating specific skills and tools for efficient utilization.

EFFICIENT DATA STORAGE WITH AMORTIZED TABLES

Period	Beginning Balance	Payment	Principal Payment	Interest Payment	Ending Balance
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Different Formats of Gridded Data

- **NetCDF** (Network Common Data Form) is widely used in climate and meteorological data, supporting large, multi-dimensional arrays of data.
- **HDF5** (Hierarchical Data Format) is a flexible and self-describing format that is well-suited for storing complex data hierarchies.
- **GRIB** (GRIdded Binary) is a widely used format for storing meteorological data. It is standardized by the WMO
- **GeoTIFF** (Geographic Tagged Image File Format) is a standard format for storing georeferenced raster data. It supports a wide range of spatial data types, including elevation, land cover, and precipitation.

Tools for Extracting Data from Gridded Formats

Type	Tools	Description
Python Libraries	netCDF4, h5py, xarray	Python libraries provide functionalities for reading and writing NetCDF, HDF5, and other gridded data formats.
Command Line Tools	ncdump, h5dump, cdo	Command line tools offer efficient ways to extract data from gridded formats, convert data between formats, and perform basic data manipulations.
Software Applications	Panoply, ArcGIS, QGIS	Specialized software applications provide interactive environments for visualizing, analyzing, and manipulating gridded data.
Cloud Computing Platform	Google Earth Engine	Very easy to play around the gridded data hosted in that platform

PYTHON PACKAGE

A **Python package** or **module** is a collection of Python code, such as functions and classes, organized to perform specific tasks or solve problems efficiently.

- **xarray**: Provides data structures for multi-dimensional arrays, enabling efficient manipulation and analysis of labeled data.
- **pandas**: Offers powerful data structures like DataFrames for data manipulation and analysis, making it a staple for data science.
- **numpy**: Provides support for large, multi-dimensional arrays and matrices, along with a collection of mathematical functions to operate on them.

