RS RAS Internship Report

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Outline

Introduction

Place of Internship

- Federal State Budgetary Institution of Science Research Station of the Russian Academy of Sciences in Bishkek (RS RAS)
- employs 137 people
- founded in 1978
- researches seismic processes and develops geodynamic models [7]

Internship Details

- 7th of September 2020 to the 7th of November 2020
- conducted remotely due to COVID–19
- AUCA supervisor was Olga Zabinyakova, Scientific Secretary of RS RAS
- RS RAS supervisor was Sanzhar Imashev Acting Head of the Laboratory for Integrated Research of Geodynamic Processes in Geophysical Fields

Educational Internship Tasks

1. familiarize yourself with web resources providing access to NASA Earth Remote Sensing data;
2. familiarize yourself with the scientific data format netCDF (Network Common Data Form);
3. study libraries used to work with the netCDF format in various computing environments.

Industrial Internship Tasks

1. register on the NASA Earthdata platform to access satellite data;
2. develop a library for working with netCDF files in the Python programming language (using satellite data as an example);
3. develop a computer application for data visualization and reanalysis of NASA MERRA2 satellite data.

Educational Internship

NASA Earthdata

- NASA Earth Remote Sensing data is available via the Earth Science Data Systems (ESDS) Program (see here)
- covers data acquisition, processing, distribution of NASA mission data
- data is free and software is open source [9]

NASA GES DISC

- NASA Goddard Earth Sciences (GES) Data and Information Services Center (DISC)
- provides data on atmospheric composition, water & energy cycles, and climate variability [2]
- provides over 3.3 Petabytes of data [1]

MERRA–2 Dataset

- Modern-Era Retrospective analysis for Research and Applications version 2
- historical climate reanalysis using satellite data
- specifically M2I3NPASM, Jan. 1 1980 to Oct. 1 2020

M2I3NPASM

- covers whole globe, measurements every 3 hours [3]
- 14 variables with latitude, longitude, time, pressure level
- some variables [11]:
  - surface pressure
  - specific humidity
  - eastward and northward wind
  - temperature, etc.

M2I3NPASM Cont.

- data available on GES DISC website (see here)
- option to download only a subset of the data
- can be restricted by time, latitude, longitude, group of variables
- full file is 1.1 GB in size [11], selection is smaller
- I chose 34°N to 48°N and 65°E to 83°E.

M2I3NPASM Cont.

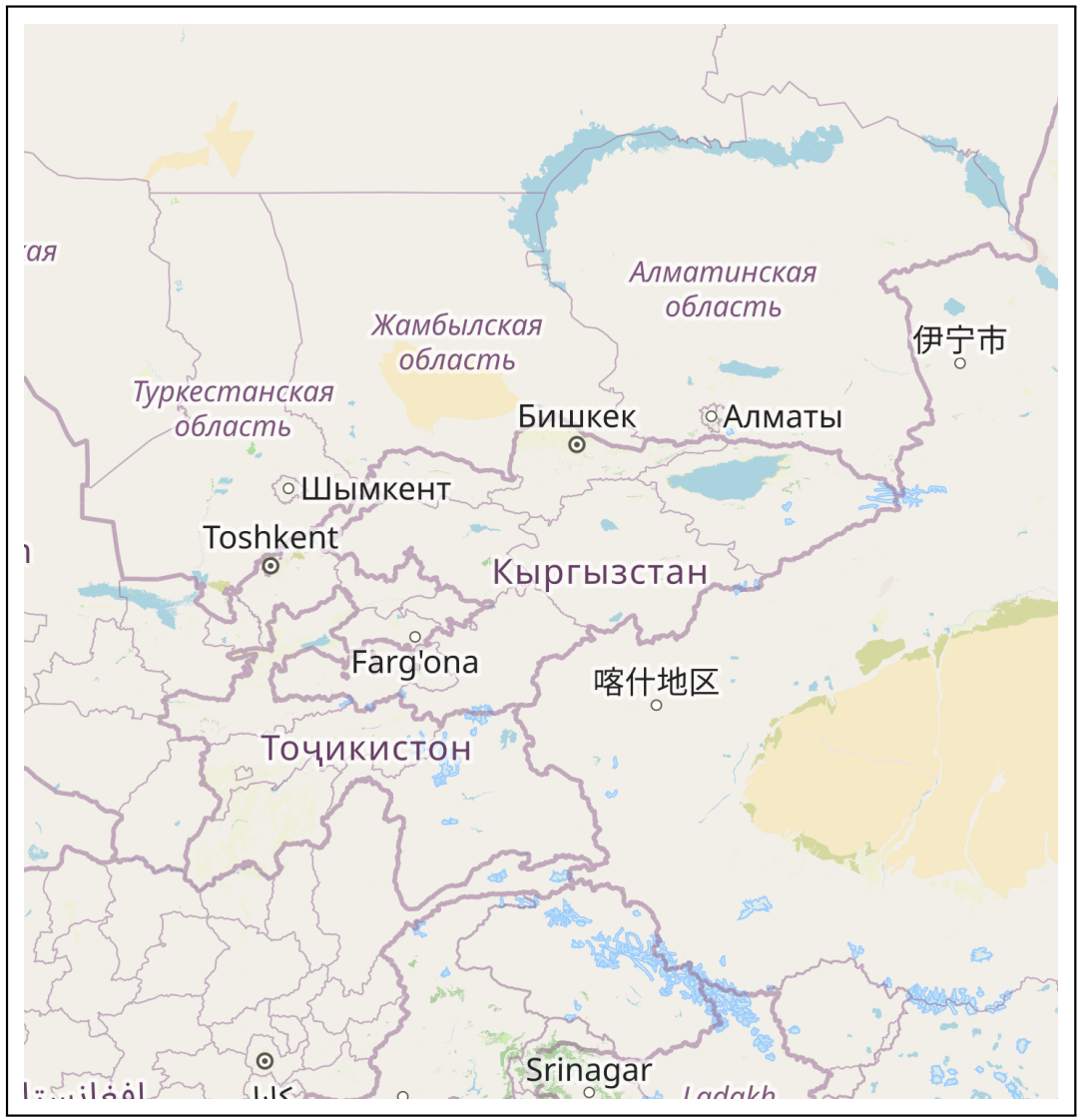

Figure 2.1: OpenStreetMap of the selected region

NetCDF Data Format

- M2I3NPASM data comes in Network Common Data Form (netCDF)
- NetCDF is data format and libraries [5]
- developed and maintained by Unidata [6]
- Unidata maintains libraries for C, Java, Fortran, Python, etc. [8].

NetCDF and M2I3NPASM

- netCDF features: self–describing, portable, scalable, appendable, sharable, archivable [5]
- M2I3NPASM has 4 dimensions [10]
  1. longitude in degrees east
  2. latitude in degrees north
  3. pressure in hPa
  4. time in minutes since the first time point in a file
- metadata includes fill value, long name, units, etc.

NetCDF Libraries

- I am working with Python, thus Python library
- NetCDF library for netCDF4 available [4]
- very popular library
- I used it to work with the GES DISC data

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