



**PRAGUE  
INSPIRE  
HACKATHON  
2020**

## **2: Agroclimatic map of selected region**

Pavel Hájek, Jiří Valeš

## **Challenge Description:** Agroclimatic map of selected region

This challenge is focused on how the **temperature changes through time** can provide invaluable information for broad number of professionals in agriculture, environmental scientists or historians. The example of such a map is an Agroclimatic Atlas Of Canada, particularly e.g. a map of Fall Freeze Dates: Average Dates of First Fall Freeze.

This challenge is about data processing, data analysis and model-based producing of detailed agroclimatic data of a region based on more coarse data (weather, topography, hydrology, soil type and so on).

# Era5-Land

- Copernicus - The Climate Data Store
- Hourly data
- 1979-2019 (last 10 years chosen)
- 7 x 7 km
- <https://confluence.ecmwf.int/display/CKB/ERA5%3A+data+documentation>

# Agroclimatic factors

Last spring frost date

First fall frost date

Frost-free period

Accumulated rainfall per week

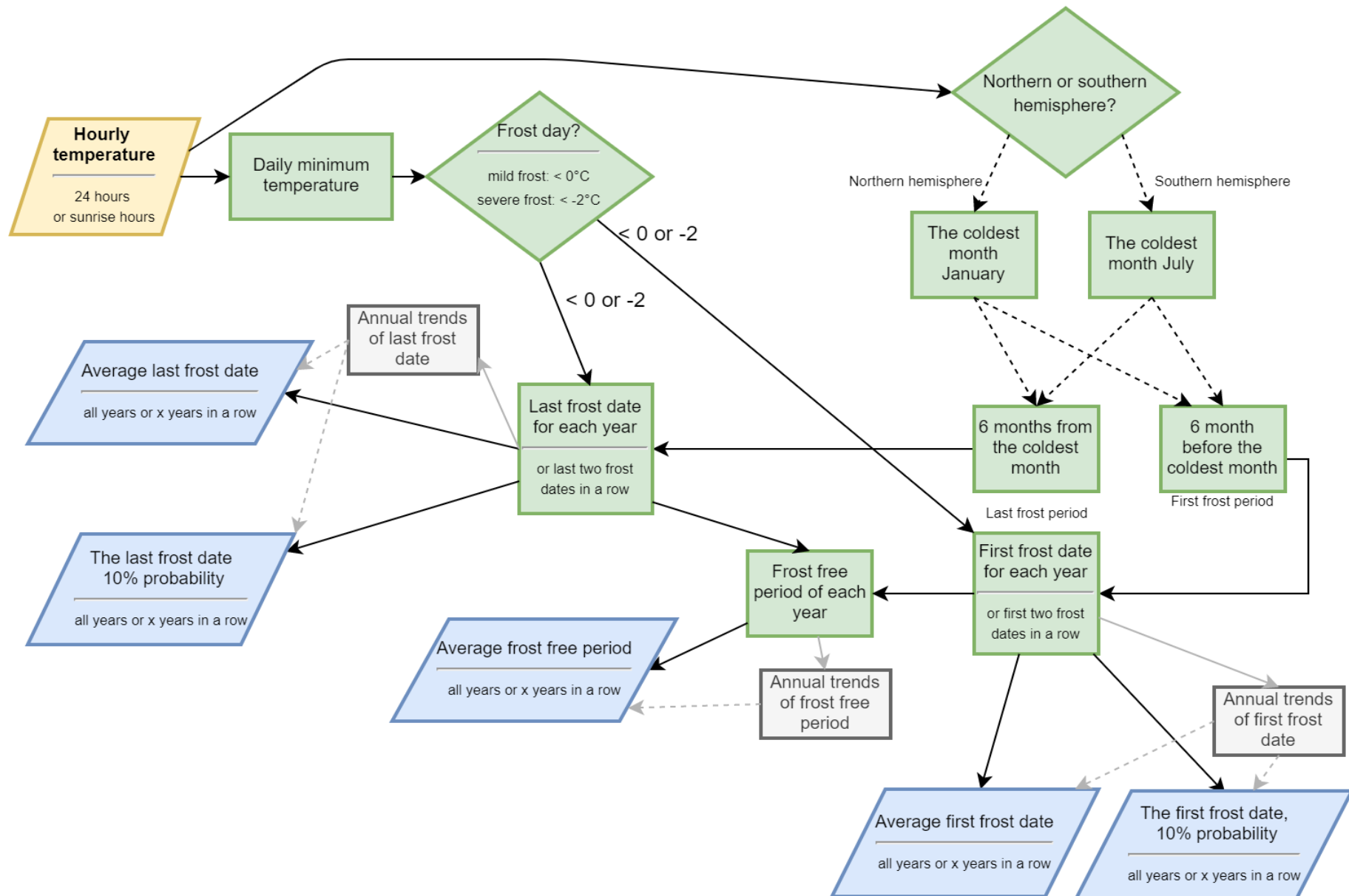
Accumulated solar radiation weekly

Annual/Seasonal Evapotranspiration

Last fall date with soil temperature above  
16/10°C -> application of fertilizers

...

# Last spring / First fall frost date



# Environment

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/ work / frostdates /

Name	Last Modified
data	5 days ago
data-pilsen	2 months ago
export	16 hours ago
export2	a month ago
auxiliary_classes-Copy1.py	5 days ago
auxiliary_classes.py	2 months ago
data.csv	5 days ago
description.txt	a month ago
frostdates.ipynb	16 hours ago
length_of_data-Copy1.ipynb	5 days ago
length_of_data.ipynb	5 days ago
more-about-frost-dates.pdf	a month ago
temperature_in_the_area.tif	5 days ago

Launcher x frostdates.ipynb x

Markdown git

### Find frost dates: function for one place

```
[24]: from datetime import date, timedelta
def findfrostdates(latitude, longitude, year, frostdegree, dayinrow, starthourday, endhourday, fnamefrostdates, im, firstlist, lastlist, nmbfrdayslist):

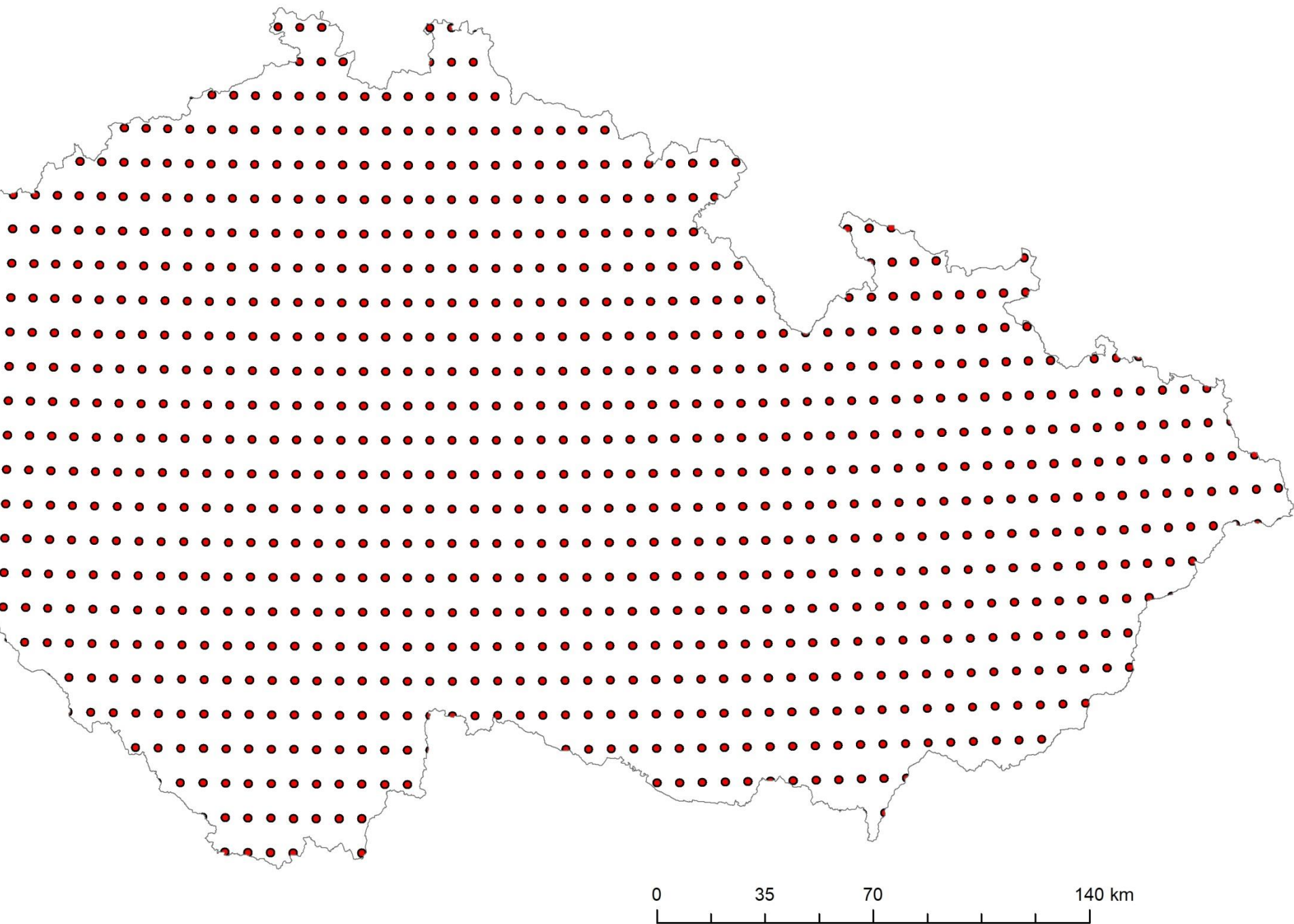
    numbfrostdays=0 # for calculating numb of frost days

    #determination of winter and summer:
    wintermonth=1
    summermonth=7
    if latitude<0:
        wintermonth=7
        summermonth=1

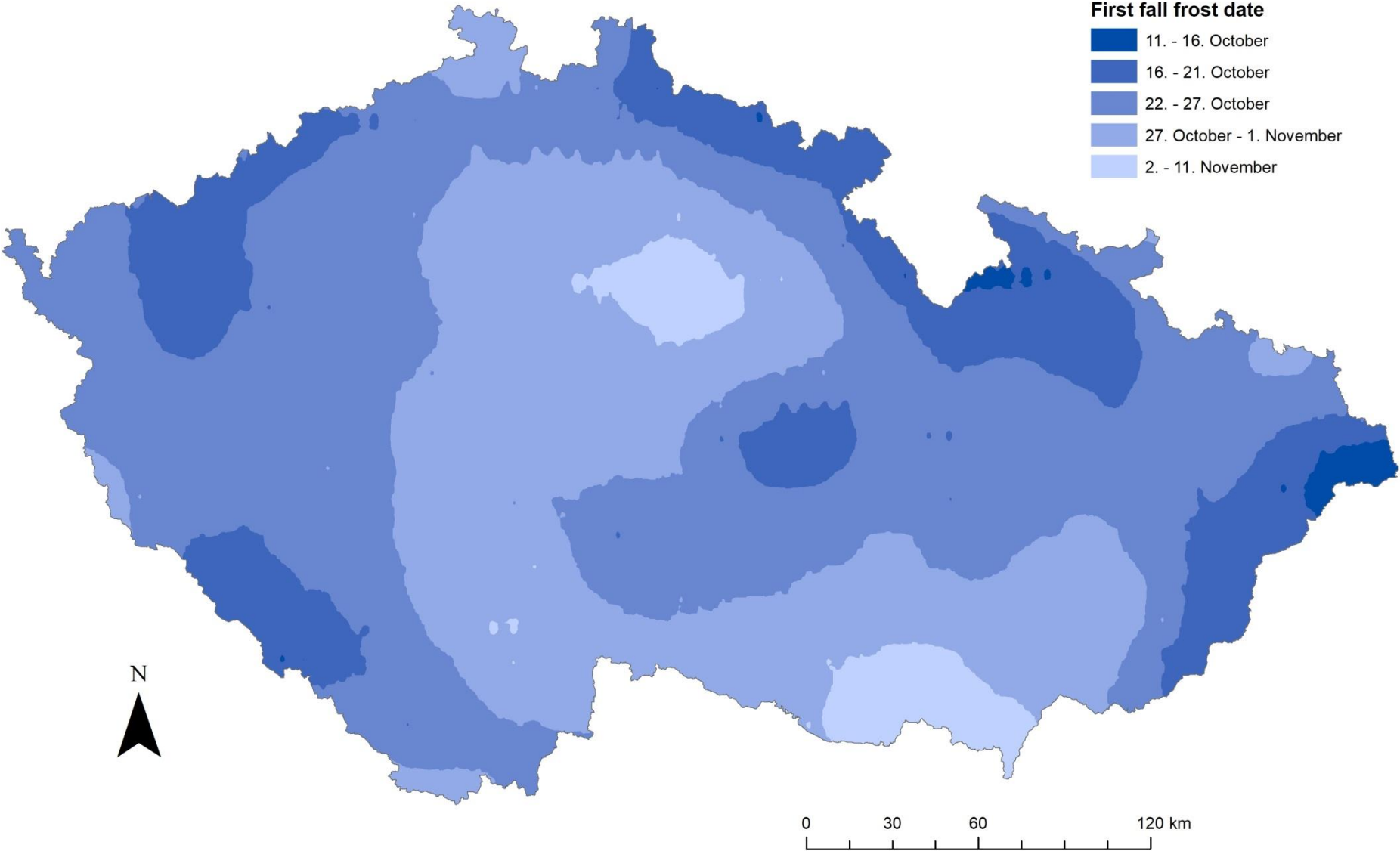
    # Last spring frost date:
    startmonth=wintermonth
    endmonth=summermonth
    lastfrostday=0
    daysbefore=0
    startdate=1
    enddate=1
    if endmonth == 1:
        endmonth=12
        enddate=31
    sdate = date(year, startmonth, startdate) # start date for searching last frost date
    edate = date(year, endmonth, enddate) # end date for searching last frost date
    delta = edate - sdate # as timedelta
    for i in range(delta.days):
        daylong = sdate + timedelta(days=i)
        sdaylong = str(daylong)
        tday = int(sdaylong[8:10])
        tmonth = int(sdaylong[5:7])
        tyear = int(sdaylong[0:4])
        daymin = 50 # start value
        for hour in range(starthourday, endhourday+1, 1): # for specific hours (all day, only sunrise hours,...)
            time=convert_time_reverse(datetime.datetime(tyear, tmonth, tday, hour, 0))
            slice_dictionary={'lon':[longitude,], 'lat':[latitude], 'time':[int(time)]}
            currenttemp=kelvin_to_celsius_vector(im.slice('tas', slice_dictionary))
            if currenttemp < daymin:
                daymin = currenttemp
            if daymin <= frostdegree: # frostday?
                numbfrostdays+=1
                lastfrostday=daylong
                if daysbefore>=dayinrow-1:
                    lastfrostday=daylong
                daysbefore+=1
            else:
                daysbefore=0

    tvarname = "LastD"+ str(year)
    print_geojson(tvarname, lastfrostday, fnamefrostdates, 0, 0, 0)
```



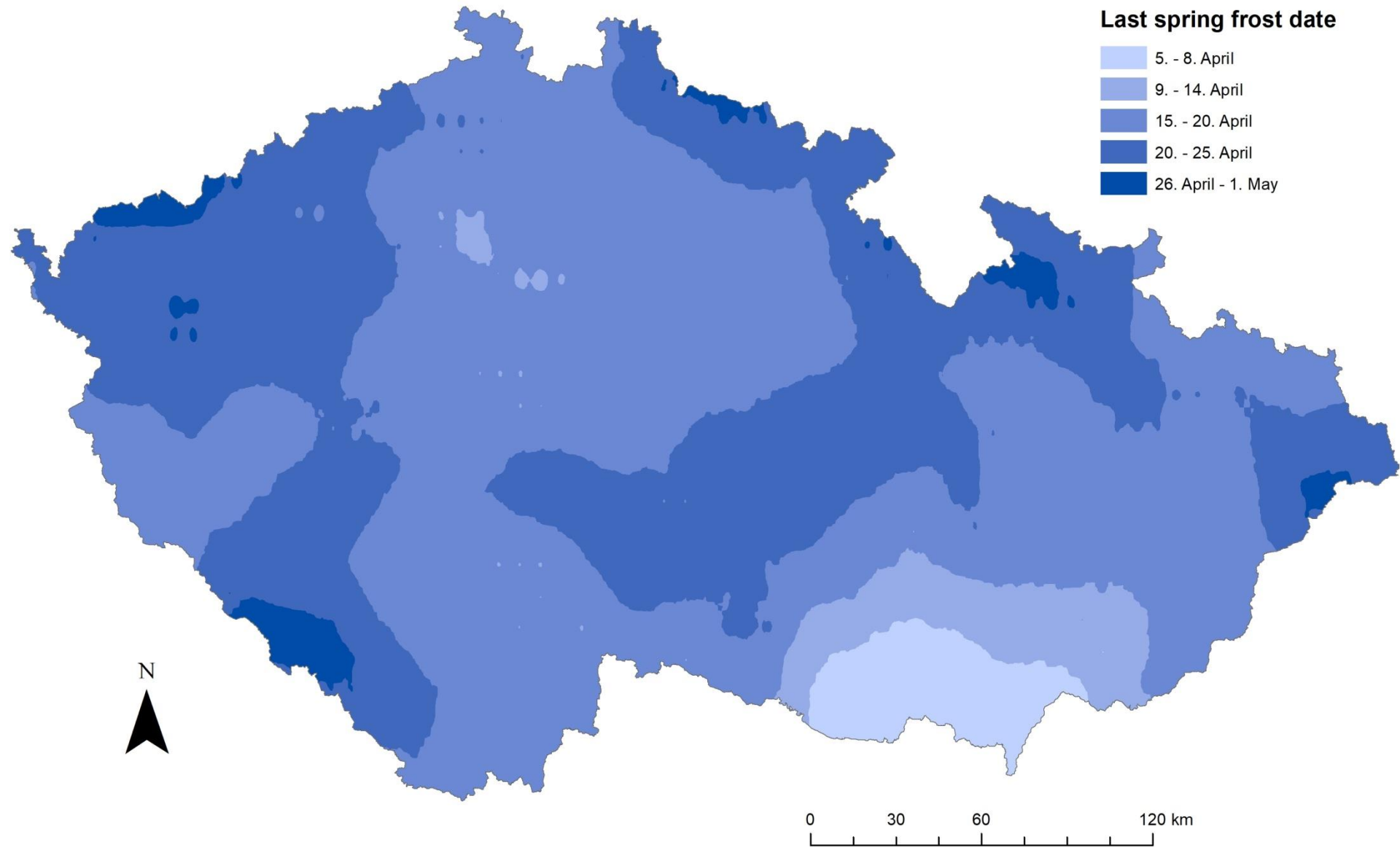


First fall frost dates with 50 probability (2009-2018)



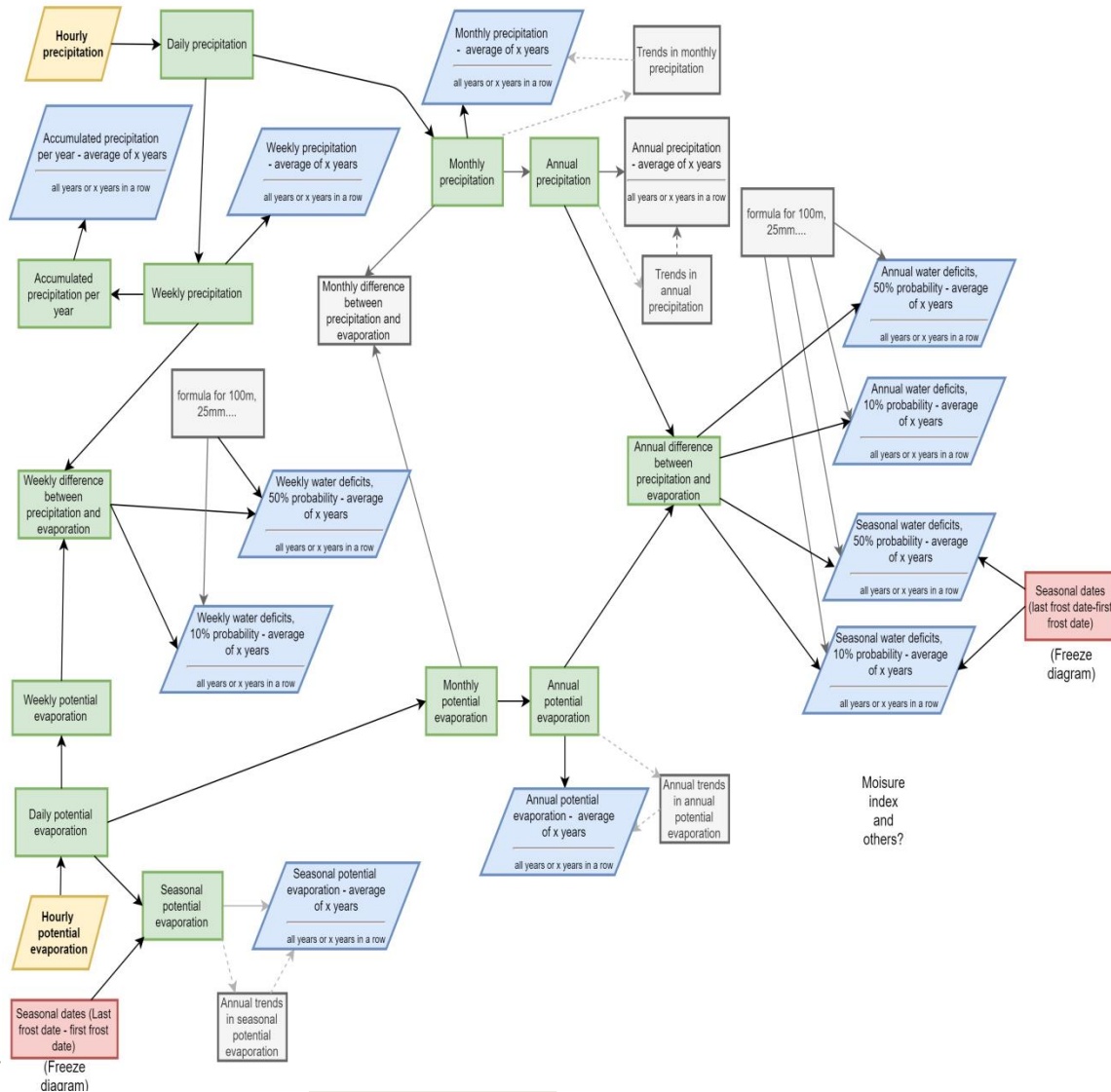


# Last spring frost dates with 50 probability (2009-2018)

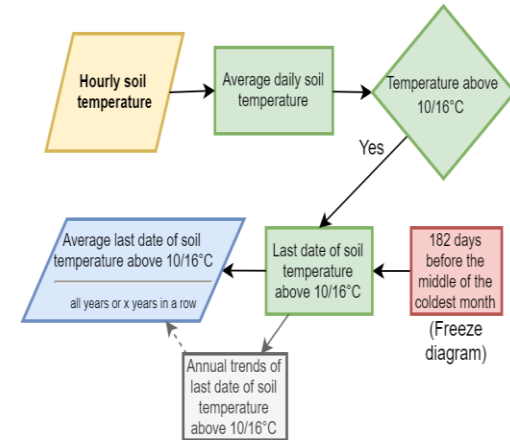


# Other diagrams

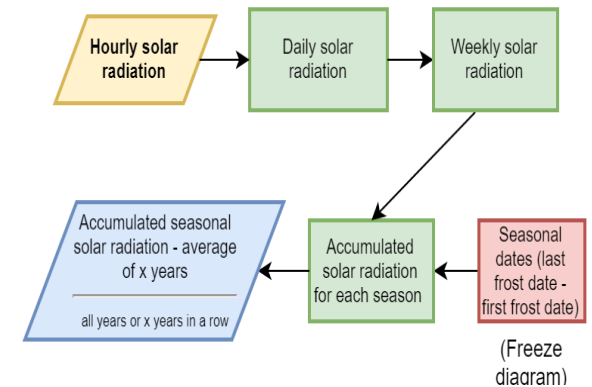
Agroclimatic factors: precipitation, evapotranspiration



Agroclimatic factors: soil temperature



Agroclimatic factors: solar radiation



# Last fall soil temperature above 10°C (2009-2018, 50% probability, 100 mm)

