discharge data

February 28, 2023

0.1 ENVM1400 - I & A - Volta group - DGRE

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[1]:
```
import glob
import os

# data/plot management
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# plotting/mapmaknig
import geopandas as gpd
import folium
from geospatial_functions import get_background_map
import rasterio
from rasterio.plot import show as rioshow
```

[2]:
```
path = os.getcwd()
home_path = os.path.dirname(os.path.dirname(path))

gis_folder = f'{home_path}\\QGIS project'
```

[3]:
```
# load in all the text files, saves typing :)
glob.glob("*.txt")
```

[3]:
```
['BLACK VOLTA, VONKORO.txt',
 'BOUGOURIBA, DAN.txt',
 'dayfile.txt',
 'discharge_combined_adjusted.txt',
 'MOU HOUN, BLACK VOLTA, SAMANDENI.txt',
 'MOU HOUN, BLACK VOLTA,DAPOLA.txt',
 'NAKANBE, WHITE VOLTA, YAKALA.txt',
 'NAKANBE, WHITE VOLTA, YILOU.txt',
 'NAZINON, RED VOLTA, DAKAYE.txt',
 'PENDJARI, PORGA.txt',
 'SINGOU, SAMBOALI.txt',
 'volt_day.txt']
```

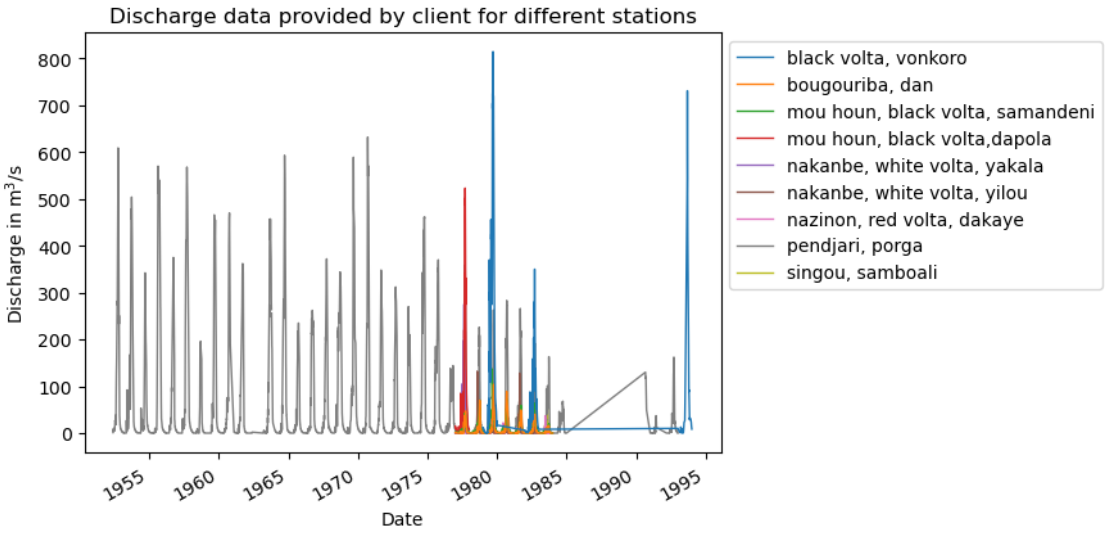
[4]:
```
# google maps locations
links = ["https://goo.gl/maps/B6rpdv8nrVrWcMGY9",
         "https://goo.gl/maps/k2Hn8jJ3aM2FLVfMA",
         'https://goo.gl/maps/GqkaLwHdsxNS8VQr7',
         "https://goo.gl/maps/bnRr46YB6gbaX7VV9",
         "https://goo.gl/maps/ymWchRtzaiqa3oqBA",
         "https://goo.gl/maps/cCHzihPvBMnuwokY8",
         "https://goo.gl/maps/9HoAGcJncrnZwyXs5",
         "https://goo.gl/maps/G1ZCWiA575tm8qUP8",
         "https://goo.gl/maps/NRH7s4NNWT2E3uvS6"
        ]

# corresponding lat/long locations
lat_lon = [[9.171205333996518, -2.7448412667392383],
           [10.867875919446051, -3.722479273356632],
           [11.458715461275865, -4.469476596583681],
           [10.572861584223373, -2.914134892035999],
           [11.344607777805557, -0.5289654226974667],
           [12.99971043752888, -1.570603458131631],
           [11.777456003610485, -1.6001563849044829],
           [11.045433053420533, 0.959913528639681],
           [11.279536764583742, 1.0158889285854777]
          ]
```

[5]:
```
# names of wanted stations
locations = ['BLACK VOLTA, VONKORO.txt',
             'BOUGOURIBA, DAN.txt',
             'MOU HOUN, BLACK VOLTA, SAMANDENI.txt',
             'MOU HOUN, BLACK VOLTA,DAPOLA.txt',
             'NAKANBE, WHITE VOLTA, YAKALA.txt',
             'NAKANBE, WHITE VOLTA, YILOU.txt',
             'NAZINON, RED VOLTA, DAKAYE.txt',
             'PENDJARI, PORGA.txt',
             'SINGOU, SAMBOALI.txt']
```

[6]:
```
# laod in the data
df_per_location_lst = []
for i in range(len(locations)):
    df = pd.read_csv(locations[i], delimiter=",")
    # do prosessing of the date columns
    df['n_month_row'] = df.apply(lambda x: str(x.date).strip()[0],axis=1)
    df['year'] = df.apply(lambda x: str(x.date).strip()[1:].strip()[-4:],axis=1)
    df['month'] = df.apply(lambda x: str(x.date).strip()[1:].strip()[:
 ↪-4],axis=1)
    # rename the index to the station name
    df.index.name = locations[i][:-4]
    # remove the original date column
```

```
    df = df.drop(columns="date")

    df_lst = []
    # make a list of dfs per month including
    for month_index in np.arange(0, len(df),3):
        # one month is 3 rows of data
        month = df[['1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11']].
↪iloc[month_index:month_index+3]\
                                                                            .
↪astype(float).to_numpy()
        # palce these 30 days in one numpy array, remove any data unwanted␣
↪(9999)
        new_month_data = month.flatten()[~np.in1d(month.flatten(), np.
↪array(9999))]
        dates = []
        # create an index column using pandas Timestamp (could be more␣
↪efficient)
        for day in range(1,len(new_month_data)+1):
            date_string = f'{df.iloc[month_index].year}-{df.iloc[month_index].
↪month}-{day}'
            dates.append(pd.Timestamp(date_string))
        # create a df for a month with the data
        new_month = pd.DataFrame(index=dates, data=new_month_data,␣
↪columns=[f'{str(locations[i][:-4]).lower()}'])
        # add each month to a list
        df_lst.append(new_month)
    # combine all these months
    df_per_location_lst.append(pd.concat(df_lst))

# remove unrealisticly high data
df_per_location_lst[-2] = df_per_location_lst[-2][df_per_location_lst[-2] < 1e6]
```

[7]:
```
# plot the data above
fig, ax = plt.subplots(1)
for i in range(len(locations)):
    df_per_location_lst[i].plot(lw=1,color=f"C{i}",ax=ax,zorder=10-i)
ax.legend(bbox_to_anchor=(1,1))
ax.get_xticks()
# ax.set_xlim(2557,5112)

ax.set_ylabel("Discharge in m$^3$/s")
ax.set_xlabel("Date")
ax.set_title("Discharge data provided by client for different stations");

fig.savefig("Discharge_data_client.png")
```



[8]:
```
df = pd.DataFrame(columns= ["name","lat", "lon"], data=list(zip(locations,np.
↪array(lat_lon)[:,0],np.array(lat_lon)[:,1])))
```

[9]:
```
df
```

[9]:

	name	lat	lon
0	BLACK VOLTA, VONKORO.txt	9.171205	-2.744841
1	BOUGOURIBA, DAN.txt	10.867876	-3.722479
2	MOU HOUN, BLACK VOLTA, SAMANDENI.txt	11.458715	-4.469477
3	MOU HOUN, BLACK VOLTA,DAPOLA.txt	10.572862	-2.914135
4	NAKANBE, WHITE VOLTA, YAKALA.txt	11.344608	-0.528965
5	NAKANBE, WHITE VOLTA, YILOU.txt	12.999710	-1.570603
6	NAZINON, RED VOLTA, DAKAYE.txt	11.777456	-1.600156
7	PENDJARI, PORGA.txt	11.045433	0.959914
8	SINGOU, SAMBOALI.txt	11.279537	1.015889

[10]:
```
# outline = gpd.read_file("region_boundary_burkina_faso.geojson")
geometry = gpd.points_from_xy(df.lon, df.lat, crs="EPSG:4326")
gdf_stations = gpd.GeoDataFrame(data=df, geometry=geometry)
```

[11]:
```
district_outline = gpd.read_file(f"{gis_folder}\\region_boundary_burkina_faso.
↪geojson")
volta_outline = gpd.read_file(f"{gis_folder}\\volta_watershed_vector_32630.
↪gpkg",crs="epsg:32630")
main_rivers = gpd.read_file(f"{gis_folder}\\main_rivers_volta.gpkg",crs="epsg:
↪32630")

volta_outline = volta_outline.set_geometry(volta_outline.geometry.to_crs('EPSG:
↪4326'))
```

```
main_rivers = main_rivers.set_geometry(main_rivers.geometry.to_crs('EPSG:4326'))
```

[12]:
```
geometry = gpd.points_from_xy(df.lon, df.lat, crs="EPSG:4326")
gdf_stations = gpd.GeoDataFrame(data=df, geometry=geometry)
```

[13]:
```
# quick way to get the bounds
fig, ax = plt.subplots()
main_rivers.plot(ax=ax, color="C0",zorder=1)
bounds_stations = (ax.get_xlim()[0], ax.get_ylim()[0], ax.get_xlim()[1], ax.
 ↪get_ylim()[1])
volta_outline.plot(ax=ax,edgecolor="k", facecolor='none')
gdf_stations.plot(ax=ax,color="C3",markersize=15,zorder=5)


with rasterio.open(get_background_map("stations", bounds_stations)) as r:
    rioshow(r, ax=ax)

ax.set_title("Measurement location of discharge data supplied by client")
ax.set_xlabel("Longditude$^{\circ}$");
ax.set_ylabel("Latitude$^{\circ}$");
```