

# Aula 25

Input de dados xls mais estruturados

Mais exemplos de cartografia cartopy

# Esta semana

Notas do projeto A:

Enviadas por Fenix. Verifiquem! Podem existir problemas por falta de assinatura do projeto.

Exame tipo no moodle: terça feira 26 de Maio 13-14h

# Exame tipo: os exames serão diferentes para cada participante

Parte 1: V/F

Escolher as opções Verdadeiras/Falsas (podem ser todas verdadeiras ou todas falsas)

Parte 2: Escolha múltipla

Escolher a (ÚNICA) opção verdadeira

Parte 3: Fragmento

Escrever pedaços de Código

Parte 4: Problema

Escrever uma função para resolver um problema

# Dados estruturados em excel (417x333)

Clipboard Font Alignment

A1 : X ✓ fx 290.477770010379

	A	B	C	D	E	F	G	H	I	J	K	L
1	290.4778	290.4839	290.4853	290.4846	290.4838	290.4823	290.4816	290.477	290.4703	290.4602	290.4519	290.4466
2	290.466	290.4675	290.4652	290.4612	290.4596	290.4611	290.4619	290.4594	290.4531	290.4438	290.4359	290.4305
3	290.453	290.4536	290.4502	290.4462	290.4462	290.4489	290.4529	290.4508	290.447	290.4366	290.4311	290.4239
4	290.4385	290.44	290.4421	290.4483	290.4491	290.4437	290.4531	290.4492	290.4509	290.4349	290.4334	290.4199
5	290.4341	290.4368	290.4396	290.446	290.463	290.4582	290.455	290.4575	290.4446	290.4434	290.4282	290.4289
6	290.4387	290.4415	290.4464	290.4575	290.4649	290.4831	290.4602	290.464	290.4527	290.4424	290.4382	290.4252
7	290.4526	290.4545	290.4583	290.4689	290.4755	290.4962	290.4702	290.4589	290.4591	290.4412	290.4487	290.4421
8	290.4653	290.4672	290.4699	290.4804	290.487	290.5069	290.4895	290.4699	290.4667	290.458	290.4547	290.451
9	290.4789	290.4814	290.481	290.4889	290.5026	290.4958	290.5126	290.5026	290.4845	290.4719	290.452	290.4413
10	290.4855	290.4957	290.4951	290.5007	290.5174	290.5096	290.5054	290.5008	290.4935	290.4846	290.4689	290.452
11	290.499	290.5074	290.5038	290.5092	290.5177	290.5038	290.4948	290.4863	290.4714	290.4507	290.4337	290.4158
12	290.5111	290.5165	290.5099	290.4976	290.49	290.4889	290.4719	290.4555	290.4326	290.4048	290.3722	290.3644
13	290.5201	290.5226	290.5074	290.4873	290.4615	290.4542	290.4275	290.4028	290.3894	290.3694	290.3693	290.3731
14	290.5216	290.5162	290.4955	290.4683	290.4456	290.4252	290.4077	290.3958	290.4039	290.4162	290.4233	290.3778
15	290.4968	290.4881	290.4721	290.4549	290.4319	290.4227	290.4247	290.4263	290.4277	290.4329	290.4498	290.4402
16	290.4482	290.4332	290.435	290.437	290.4468	290.4543	290.462	290.4557	290.4467	290.4427	290.4432	290.4361
17	290.4414	290.4189	290.4219	290.4322	290.4604	290.4801	290.4909	290.5052	290.5187	290.5184	290.5015	290.4452
18	290.4726	290.4524	290.4542	290.4683	290.4873	290.4988	290.5039	290.5025	290.4828	290.4622	290.4384	290.3889
19	290.5576	290.5592	290.5604	290.5535	290.538	290.5134	290.4803	290.4494	290.4322	290.44	290.4047	290.3032
20	290.5998	290.6102	290.6018	290.5718	290.5274	290.4854	290.438	290.3942	290.3726	290.3712	290.3326	290.2431
21	290.6083	290.6054	290.5872	290.561	290.5157	290.4608	290.4054	290.3438	290.305	290.262	290.2592	290.2691
22	290.5967	290.5601	290.5278	290.4918	290.4526	290.4034	290.3438	290.2887	290.2827	290.305	290.305	290.319
23	290.597	290.5342	290.4865	290.4395	290.3953	290.3555	290.3255	290.3083	290.328	290.3708	290.3806	290.3643
24	290.5976	290.5194	290.4648	290.416	290.3688	290.3426	290.3511	290.3706	290.3595	290.376	290.3836	290.3576
25	290.603	290.5262	290.4791	290.4425	290.404	290.3722	290.3797	290.4117	290.3966	290.3931	290.3892	290.3664
26	290.5886	290.508	290.4614	290.4361	290.4206	290.3993	290.3998	290.4129	290.3891	290.3864	290.4108	290.4134
27	290.5198	290.4516	290.4171	290.4043	290.408	290.4137	290.4136	290.428	290.4166	290.3881	290.3767	290.3831
28	290.3972	290.3465	290.3372	290.3524	290.3738	290.4022	290.4111	290.4039	290.4055	290.4178	290.3887	290.3459
29	290.3226	290.293	290.3083	290.3289	290.3505	290.3868	290.4067	290.3999	290.3766	290.3665	290.3932	290.3886
30	290.2843	290.2622	290.2814	290.3054	290.3373	290.3699	290.3941	290.409	290.4131	290.3572	290.3411	290.3689
31	290.2781	290.2612	290.2716	290.2979	290.3314	290.366	290.388	290.4121	290.429	290.4183	290.3575	290.3483
32	290.2705	290.256	290.2623	290.291	290.33	290.3716	290.4003	290.4228	290.4535	290.4171	290.3815	290.3605
33	290.2643	290.2556	290.261	290.2884	290.3265	290.37	290.4093	290.4158	290.4124	290.4176	290.3921	290.3484
34	290.252	290.2482	290.2542	290.2753	290.3089	290.3479	290.3732	290.3828	290.3694	290.3658	290.3448	290.3531
35	290.2485	290.2466	290.2489	290.2632	290.2887	290.3149	290.3291	290.3368	290.3289	290.3106	290.2961	290.2667
36	290.2457	290.2459	290.2466	290.2525	290.2749	290.307	290.3158	290.2977	290.3026	290.281	290.2473	290.2086
37	290.2478	290.2466	290.2428	290.246	290.265	290.2987	290.3234	290.307	290.2623	290.2732	290.2537	290.2302
38	290.2384	290.2355	290.2262	290.2245	290.2498	290.2712	290.2925	290.3054	290.2917	290.2527	290.2256	290.2256
39	290.2212	290.2165	290.204	290.2008	290.2245	290.2542	290.2705	290.2908	290.2933	290.273	290.2212	290.2076
40	290.1925	290.1862	290.1765	290.1711	290.1902	290.2287	290.2583	290.2728	290.2831	290.2719	290.2653	290.2131
41	290.1669	290.1613	290.1519	290.1509	290.1691	290.2111	290.2483	290.2586	290.2648	290.2479	290.2302	290.2083

Info Longitude Latitude Terrain Pressure Temperature qv U V W Rain

AutoSave On meteo\_model - Last Modified: Yesterday at 21:52

File Home Insert Page Layout Formulas Data Review View Help

Clipboard Font Alignment

K8 : X ✓ fx

	A	B	C	D	E	F	G	H	I	J
1	Variable	units	level	height						
2	Longitude	deg								
3	Latitude	deg								
4	Pressure	hPa	4	470m						
5	Temperature	K	4	470m						
6	qv	g/kg	4	470m						
7	U	m/s	4	470m						
8	V	m/s	4	470m						
9	W	m/s	4	470m						
10	Rain	mm	0							
11	Terrain	m	0							
12										
13	year	2015								
14	month	6								
15	day	9								
16	hour	22								
17	min	0								
18	sec	0								
19										
20										
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Info Longitude Latitude Terrain Pressure Temperature qv U V W Rain

# Preliminares

```
import cartopy.crs as ccrs
import matplotlib.pyplot as plt
import numpy as np
import openpyxl as pyxl
```

```
dados=['meteo_model.xlsx']
sheets=['Longitude', 'Latitude', 'Pressure', \
'Temperature', 'U', 'V', 'W', 'qv', 'Rain', \
'Terrain']
nvar=len(sheets)
wb=pyxl.load_workbook(dados[0])
```

# info

```
wb=pyxl.load_workbook(dados[0])
wsI=wb['Info']
ano=wsI['B13'].value
mes=wsI['B14'].value
dia=wsI['B15'].value
hora=wsI['B16'].value
minuto=wsI['B17'].value
segundo=wsI['B18'].value
timeS=str(ano)+'-'+str(mes)+'-'+str(dia)+'\
      '+str(hora)+':'+str(minuto)\
      +':'+str(segundo)
```

	A	B	C	D
1	Variable	units	level	height
2	Longitude	deg		
3	Latitude	deg		
4	Pressure	hPa	4 470m	
5	Temperature	K	4 470m	
6	qv	g/kg	4 470m	
7	U	m/s	4 470m	
8	V	m/s	4 470m	
9	W	m/s	4 470m	
10	Rain	mm	0	
11	Terrain	m	0	
12				
13	year	2015		
14	month	6		
15	day	9		
16	hour	22		
17	min	0		
18	sec	0		
19				
20				

# Leitura dos mapas

```
sheets=['Longitude', 'Latitude', 'Pressure', \
'Temperature', 'U', 'V', 'W', 'qv', 'Rain', \
'Terrain']

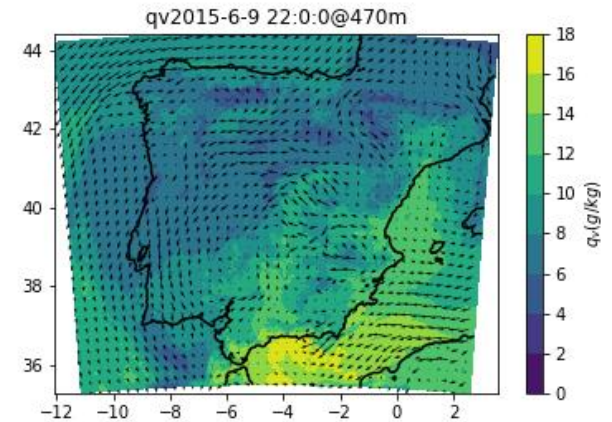
ivar=0
for variable in sheets:
    ws=wb[variable]
    if variable=='Longitude':
        rows=ws.max_row #identifica dimensão da worksheet
        cols=ws.max_column
        var=np.zeros((rows,cols,nvar))

        for r in range(rows):
            for c in range(cols):
                var[r,c,ivar]=ws.cell(row=r+1,column=c+1).value
        ivar=ivar+1

lon=var[:, :, 0]; lat=var[:, :, 1]
```

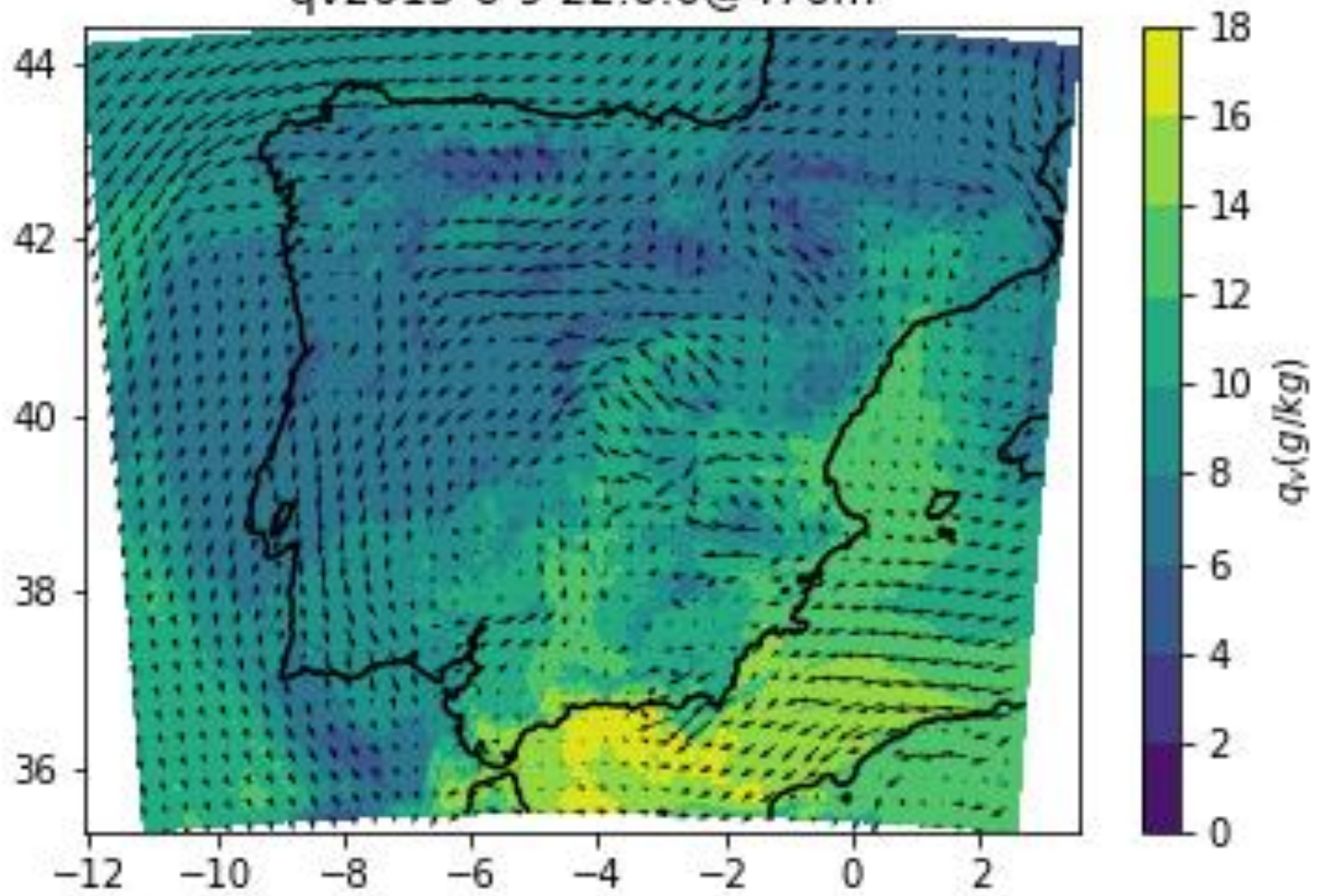
## Figura básica

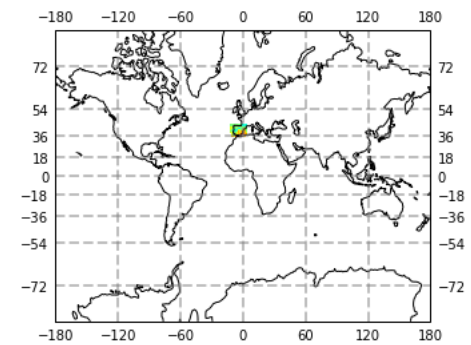
```
Q=var[:, :, 7]
plt.figure()
Qmap=plt.contourf(lon, lat, Q)
plt.colorbar(Qmap, label=r'$q_v$ (g/kg)')
plt.contour(lon, lat, var[:, :, 9], colors=\
    'black', levels=[10]) #linha de costa
plt.title('qv'+timeS+'@470m')
plt.quiver(lon[::10, ::10], lat[::10, ::10], \
    var[:, :, 4], var[:, :, 5])
#vento (u,v, 1 em cada 10*10 pontos)
```



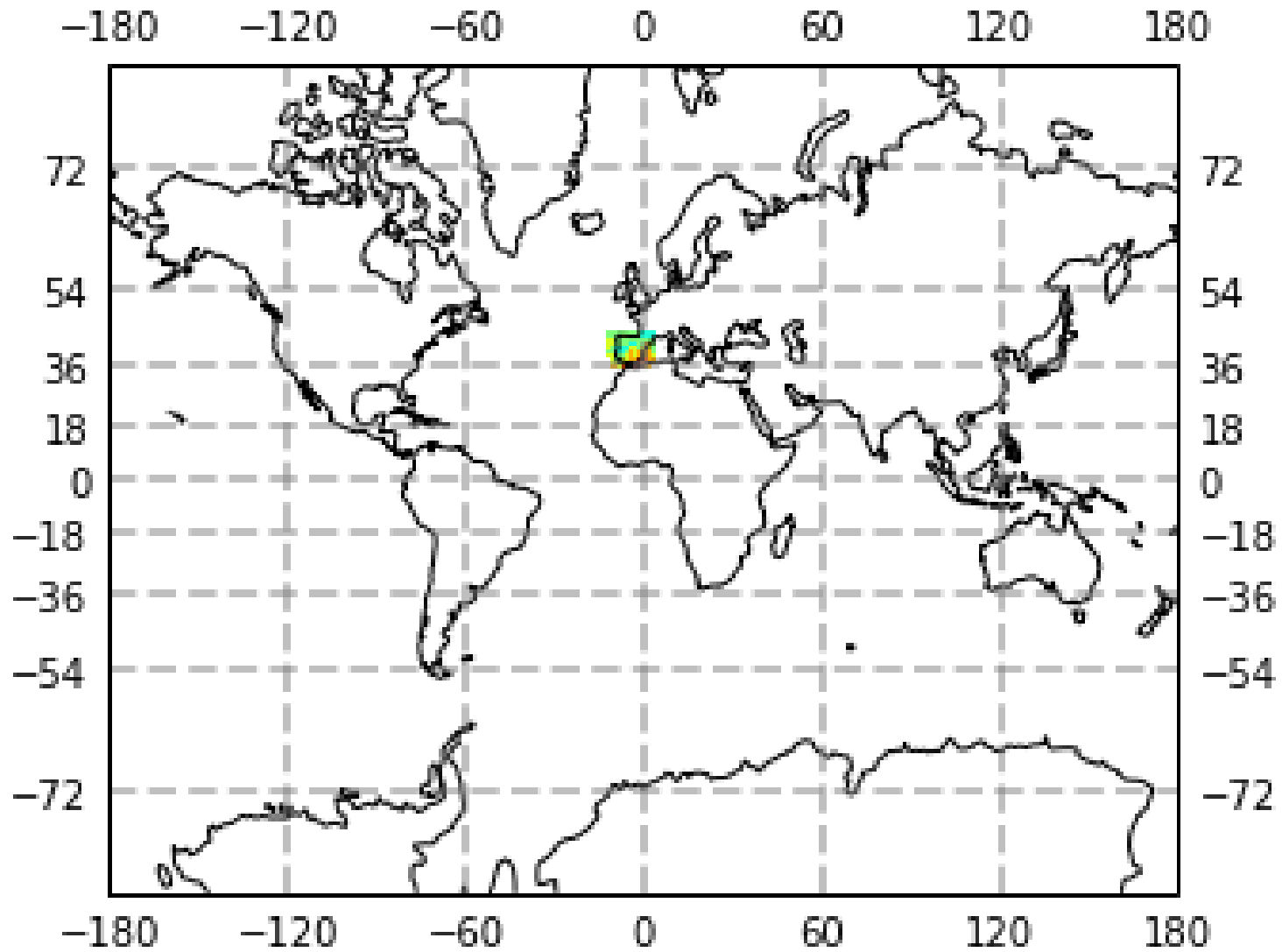


qv2015-6-9 22:0:0@470m

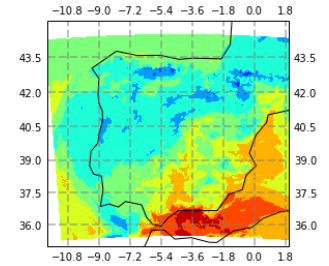




```
projection =ccrs.Mercator(central_longitude=0, \  
    max_latitude=80,min_latitude=-80,globe=None)  
ax = plt.axes(projection=projection)  
ax.set_global()  
ax.coastlines(resolution='110m')  
data_crs=ccrs.PlateCarree()  
ax.contourf(lon,lat,Q,cmap='jet', \  
    transform=data_crs )  
gl = ax.gridlines(crs=ccrs.PlateCarree(), \  
    draw_labels=True,linewidth=2,color='gray', \  
    alpha=0.5, linestyle='--')  
plt.show()
```



# Zoom Mercator



```
projection =ccrs.Mercator(central_longitude=0,\
    max_latitude=80,min_latitude=-80,globe=None)
ax = plt.axes(projection=projection)
ax.set_global()
ax.coastlines(resolution='110m')
data_crs=ccrs.PlateCarree()
ax.contourf(lon,lat,Q,cmap='jet',\
    transform=data_crs )
ax.set_extent([-12,2,35,45], crs=ccrs.PlateCarree())
gl = ax.gridlines(crs=ccrs.PlateCarree(),\
    draw_labels=True,linewidth=2, color='gray', \
    alpha=0.5, linestyle='--')
```

