



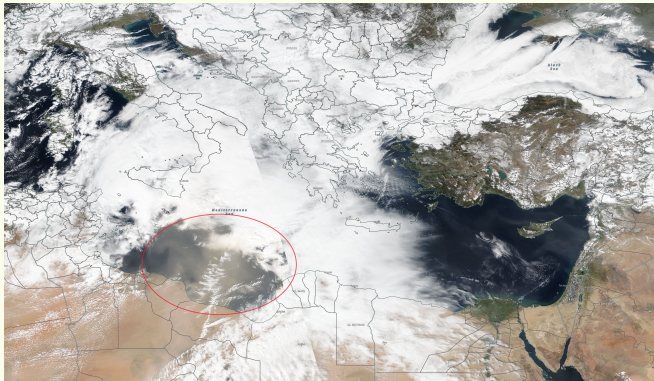
СОФИЙСКИ УНИВЕРСИТЕТ
„СВ. КЛ. ОХРИДСКИ“
ФИЗИЧЕСКИ ФАКУЛТЕТ
КАТЕДРА „МЕТЕОРОЛОГИЯ И ГЕОФИЗИКА“

Пренос на сахарски пясък над България (Saharan dust transport to Bulgaria)

РАЛЕНА ИВАНОВА ИЛИЕВА

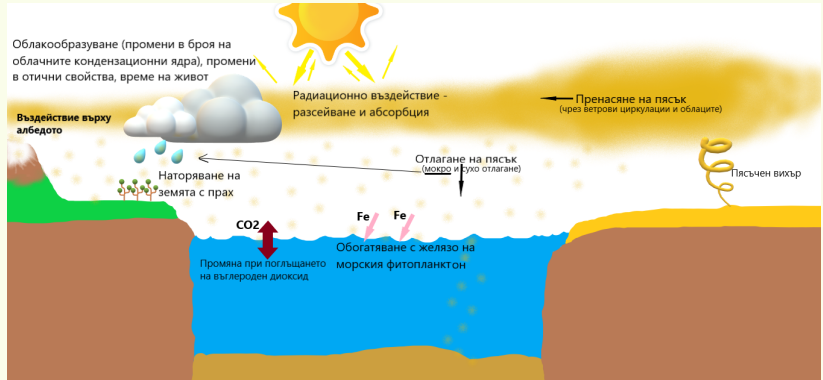
4-ти научен семинар "Физика на Земята, атмосферата и океана", с. Баня, 2022

- definition from The World Meteorological Organization (WMO) ;
- sand and dust storms (SDSs) are a hazardous meteorological phenomenon in arid and semi-arid regions;
- the Sahara is considered the main source of dust on Earth.



Фигура: Satellite image of a SDS over the Central Mediterranean,
25 III.2020 Source: <https://worldview.earthdata.nasa.gov>

Dust in the atmosphere strongly interacts with the Earth-Atmosphere system and has both direct and indirect influences.



Фигура: Interaction of dust with the Earth-Atmosphere system.

- Sand and Dust Storm Warning Advisory and Assessment System - SDS-WAS, established by WMO, 2007;
- the European scientific network COST CA16202 "International Network to Encourage the Use of Monitoring and Forecasting Dust Products" (InDust), 2017;
- Ground-based aerosol monitoring systems in Europe - EMEP, AERONET, CARAGA, EARLINET and etc.;
- Remote sensing systems - Meteosat second generation geostationary (MSG) satellites.

- The Laser Radars Laboratory of the Institute of Electronics at the Bulgarian Academy of Sciences (IE-BAS) - monitoring of atmospheric pollutants;
- a study of dust storms in Bulgaria by Latin Latinov;
- the influence of dust particles from the Sahara on the chemical composition of rain samples;
- The National Institute of Meteorology and Hydrology - forecasts for the expected transport of dust.

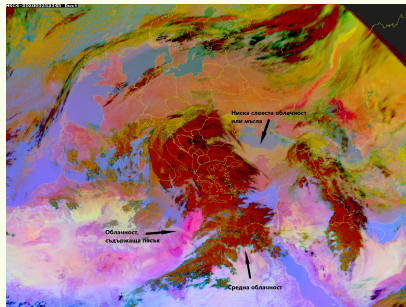
The main reason for the formation of SDSs is atmospheric circulation.

- Mediterranean cyclones:
 - The Mediterranean Sea - a seasonal cyclogenetic region;
 - 3 main trajectories;
 - wind circulation - Siroko, Foehn;
 - Mediterranean cyclones and the weather in Bulgaria.
- African depressions:
 - a cyclogenetic area of Mediterranean cyclones located off the northern parts of Africa;
 - their formation over arid regions of North Africa means they have low moisture content and are associated with sandstorm;
 - the main reason for the transport of dust from the Sahara desert over the Mediterranean and the Balkans.

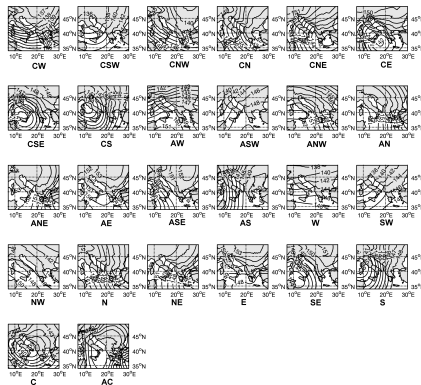
- Synoptic analysis:
 - ground synoptic charts;
 - baric topography charts at 500 hPa and 850 hPa isobaric surface;
- Satellite information - the Dust RGB product obtained by the Spinning Enhanced Visible and Infrared Imager (SEVIRI) of the Meteosat Second Generation satellites (MSG).

Color	Band / Band Diff. [μm]	Physically relates to
Red	IR12.0-IR10.8	Cloud optical thickness, Thin dust
Green	IR10.8-IR8.7	Cloud phase
Blue	IR10.8	Temperature

Таблица: Dust RGB spectral IR channels

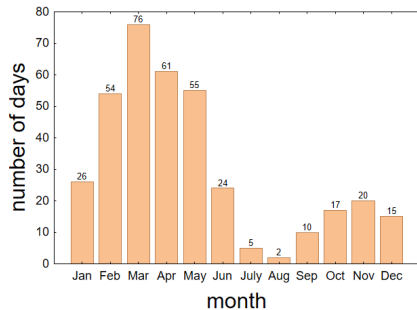
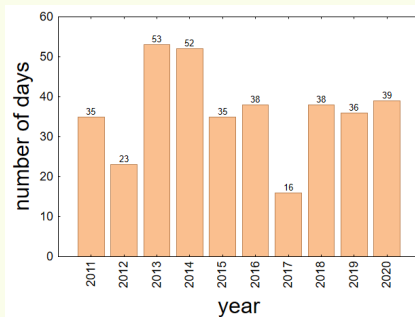


- Objective circulation classification:
 - Cost733class software is used to classify atmospheric circulation. Two circulation classifications are selected, Gross Wetter-Types (GWT) and Jenkinson-Collison Type (JCT);
 - the geopotential at 850 hPa height from the ERA5 atmospheric reanalysis was used as an input parameter in the software;
 - Atmospheric circulation types are calculated for the Central Mediterranean and South-Eastern Europe, and for this purpose three indices are calculated: W, M and Z.

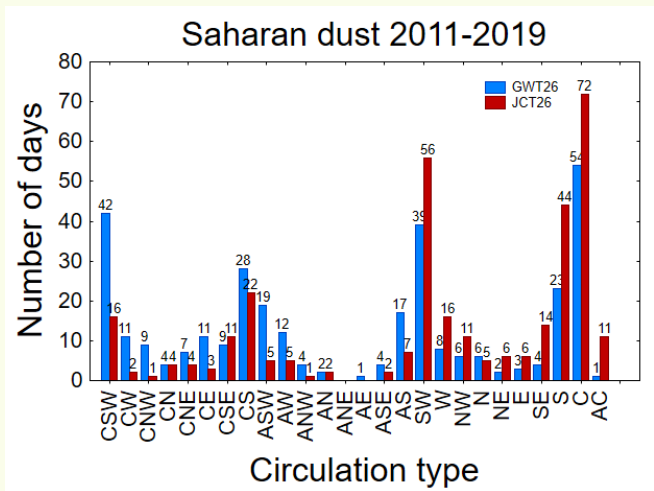


Climatology of Saharan dust transport to Bulgaria for the period 2011-2020:

- for the period, 365 days with the transport of air masses with the presence of Saharan dust were determined.

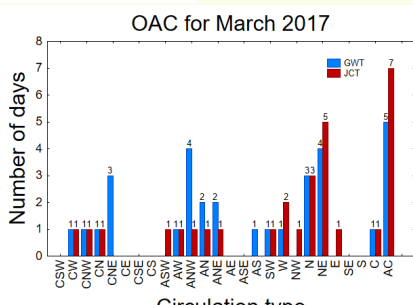
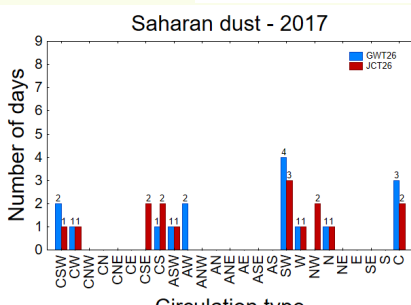
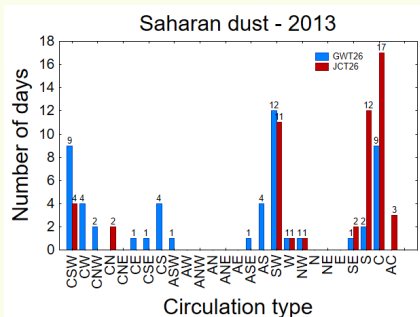


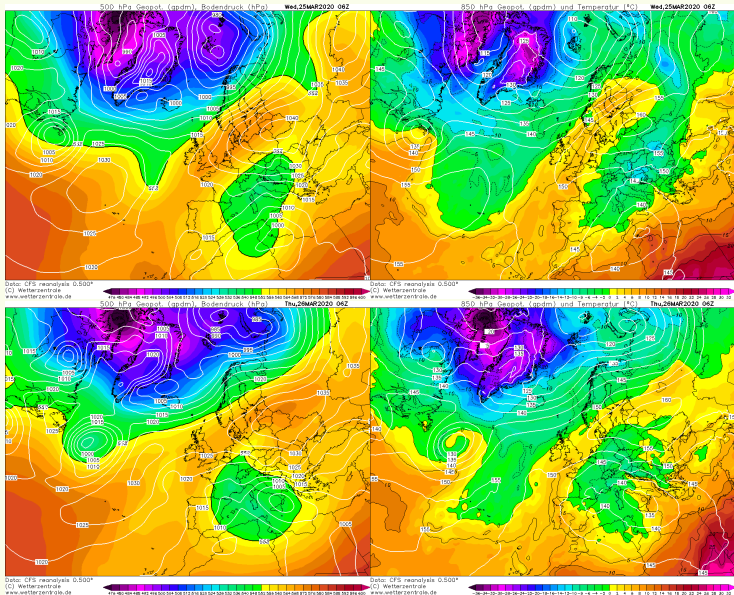
Saharan dust transport circulation classification:

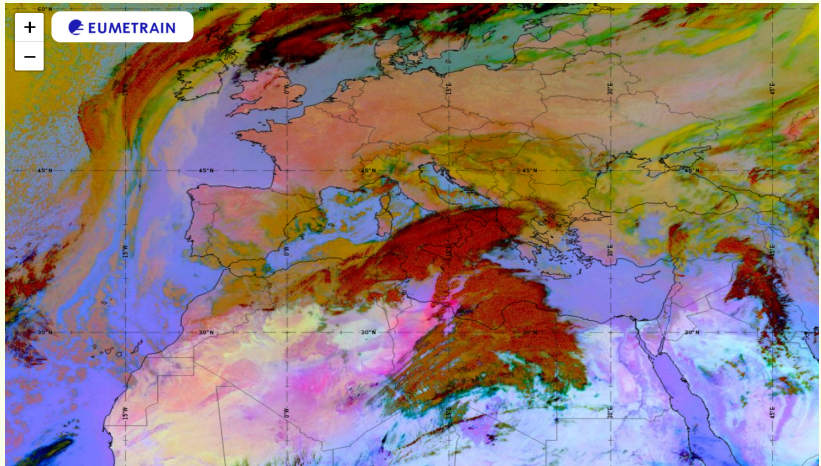


Фигура: Objective circulation classifications GWT26 (blue columns) and JCT26 (red columns) for days with Saharan dust transport for the period 2011-2019

Saharan dust transport circulation classification:







Фигура: Satellite image from Dust RGB (Meteosat), 25 March 2020 at 06 UTC Source: www.eumetrain.org

- for the period, 365 days with the transport of air masses with the presence of Saharan dust were determined;
- the maximum number of days with transport from the Sahara was in 2013 – 53 days and the minimum – 16 days in 2017.;
- the month with the largest number of days is March - 76 days and the rarest transport of Saharan dust over Bulgaria is observed during the summer months;
- the main circulation types with transport of African dust are associated with the development of Mediterranean cyclones and transport of air masses from the south-southwest;
- in the JCT26 circulation classification, the number of cases with a cyclone over the Central Mediterranean (C) is 72, and with a transport from the southwest (SW) is 56;
- in the GWT26 circulation classification, the cases with a cyclonic type (C) are 54, and with a SW type are 56.

DUST

R. Ilieva

Intro

SDSs

Methods

Results

БЛАГОДАРЯ ЗА ВНИМАНИЕТО!