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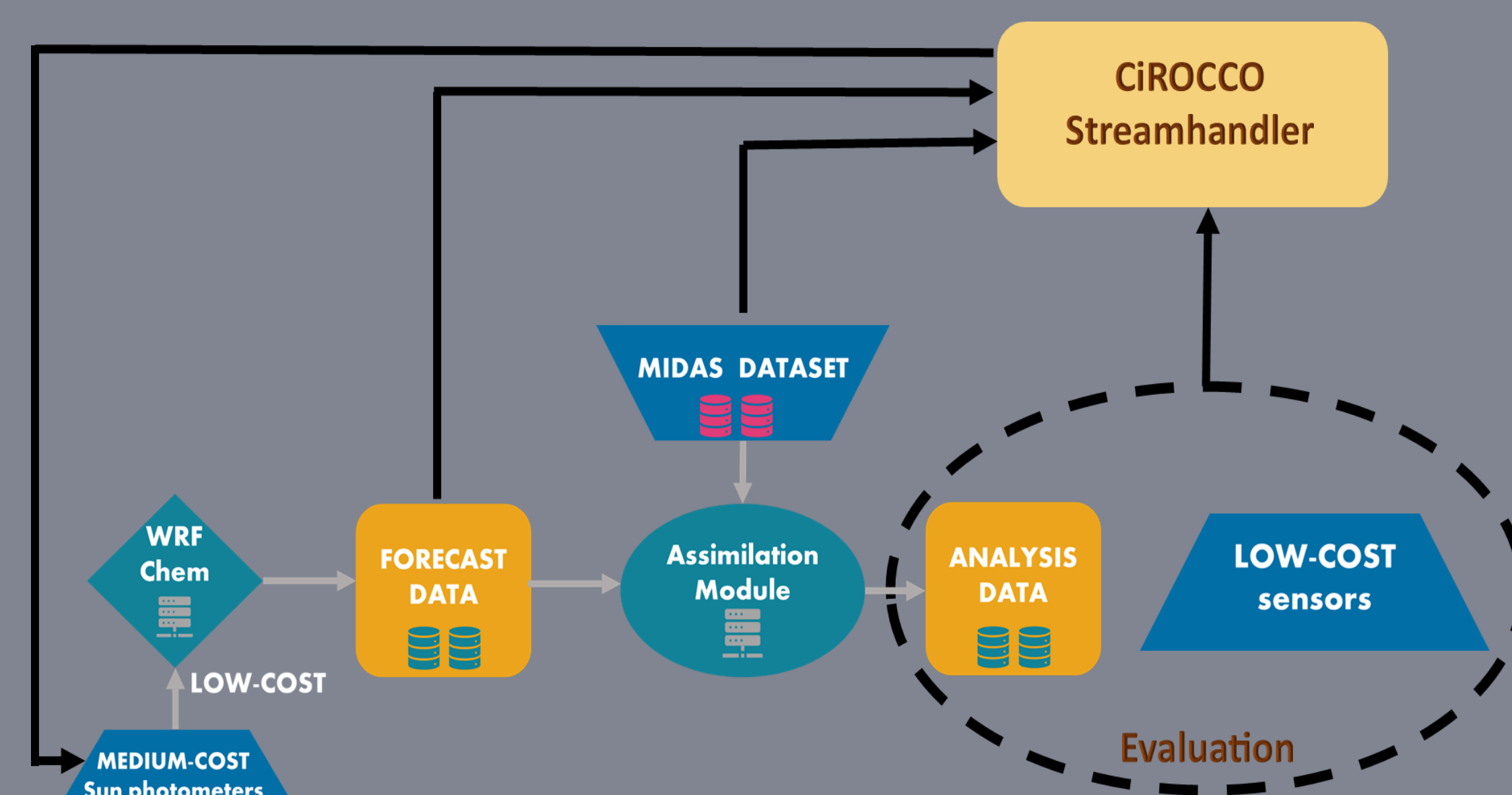
## Introduction

Dust aerosols influence critical atmospheric processes (e.g. radiation, nutrient deposition). The inherent complexity of dust emissions, transport, and deposition contributes to significant uncertainties in aerosol model predictions.

This study in the framework of CiROCCO, combines advanced numerical modelling with satellite observations to enhance dust forecasts over the Mediterranean region.

The Weather Research and Forecasting model coupled with Chemistry (WRF-Chem) is applied to simulate dust activity during September 2021. The simulations are improved by assimilating satellite-based dust optical depth (DOD) data from the MIDAS (Mineral Dust Aerosol Satellite) product.

Data from low and mid-cost sensors of AOD and PM in under sampled arid regions will be used to evaluate the assimilation process.



## Research

### Methodology

#### WRF-Chem v4.2

- Domain that includes the main dust sources
- 12 kmx12 km resolution; output every 3h
- AFWA dust scheme
- RRTMG (shortwave, longwave) radiation scheme
- Purdue Lin microphysics scheme

#### Assimilation

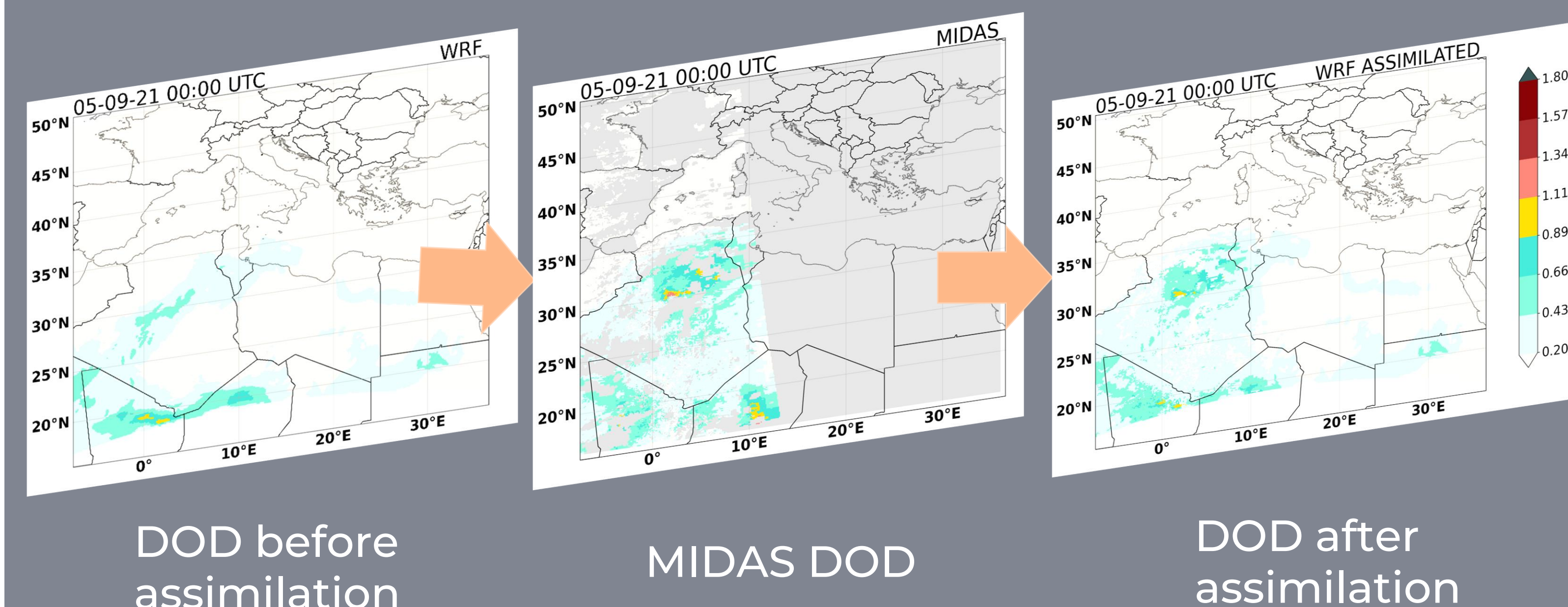
Newtonian relaxation method  
Previously applied on MSG AOD assimilation.  
12 h assimilation window

$$\frac{\partial C}{\partial t} + k(C - C_T) = 0$$

$C$ : prognostic field       $k$ : nudging coefficient  
 $C_T$ : observation field

## Results

An example case for 05-09-2021



## Conclusions

- DOD forecast is significantly improved, and it is closer to MODIS observations.
- Dust concentration, dust deposition fields altered by the assimilation process.

## Future Steps

During the next months, the CiROCCO observation campaign will be held on Pilot areas (Egypt, Cyprus, Serbia and Spain).

Our next steps include:

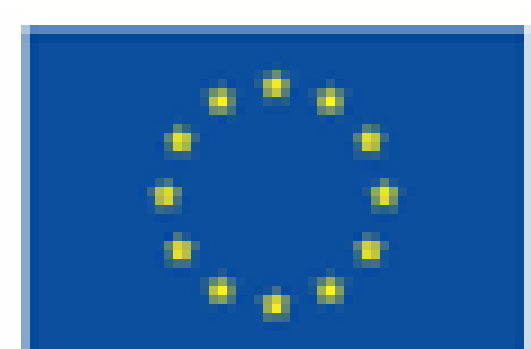
- Apply the methodology during the CiROCCO campaign
- Perform an evaluation analysis using the collected AOD, PM measurements from the CiROCCO campaign

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