



# Assessing the impact of urban land conversion on local and regional surface climate and its socio-economic consequence

## Team Members

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## Challenges in Urban Science

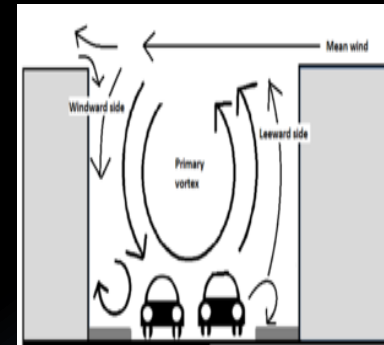
- Cities are not built the same way ...nor are they built with same materials
- Difficult to characterize them across the globe and study their impacts at global scales



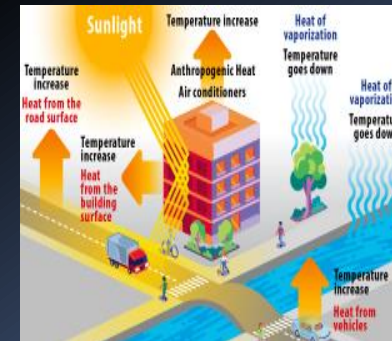
- Urbanization must be mapped at a scale that resolves the urban metabolism



- Cities, interact with atmosphere and require multi-level models that capture both the lateral and vertical mass and energy fluxes

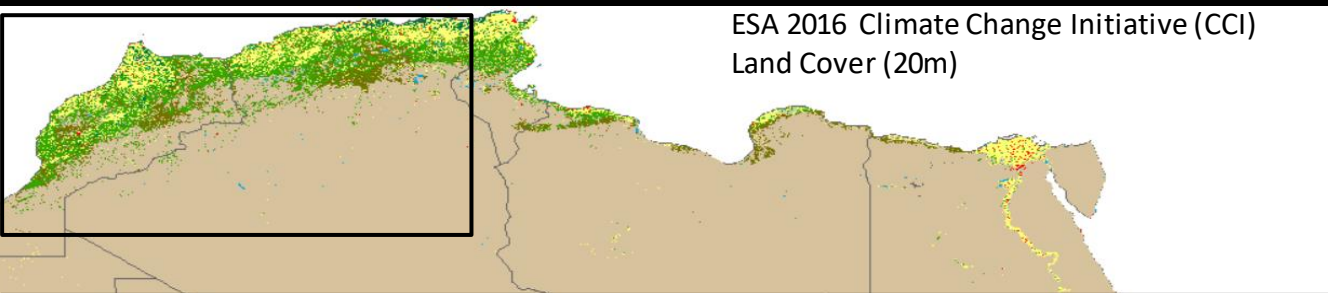


- People, in cities, create coupled anthropogenic-natural interactions that require detailed socio-economic modeling.



## Northwest Africa as a hot spot

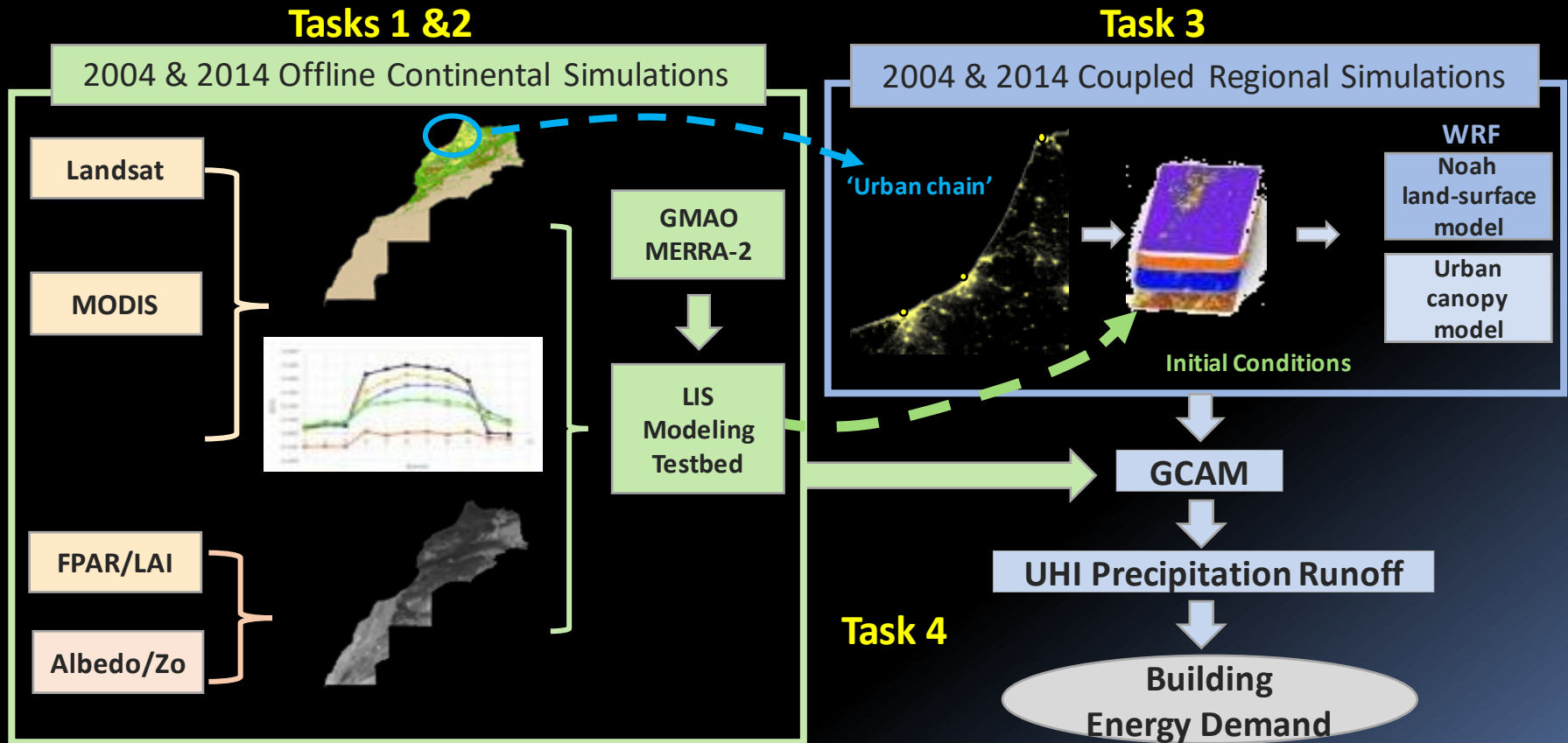
- Northwest Africa is mostly desert and about 80% of the population live in about 20% of the land
- With increase in population, land conversion to urban is happening on fertile arable lands
- The risk of desertification due to climate is challenged by that due to urbanization ....





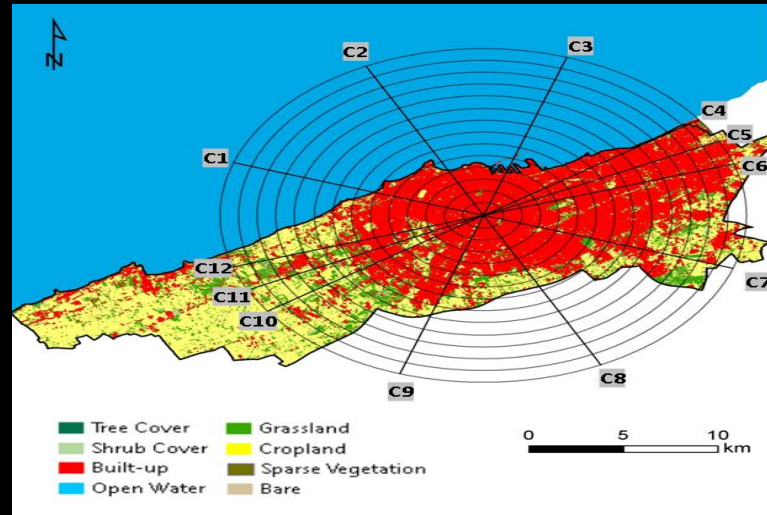
## Objectives of the study

1. Map urbanization in cities of Morocco, analyze the thermal structure UHI/UHS
2. Simulate the impact of buildup on surface climate
3. Understand the impact of urbanization on the vertical structure of the lower troposphere.
4. Quantify the economic consequences of urban heating/cooling in terms of energy demand

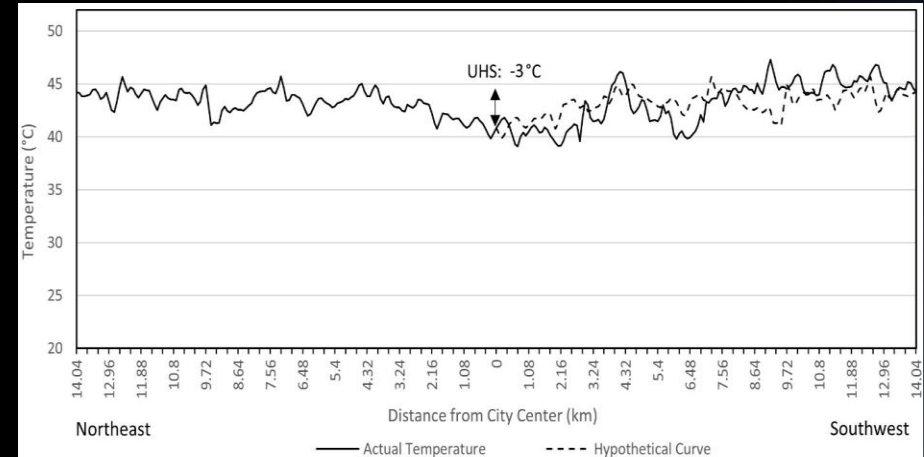
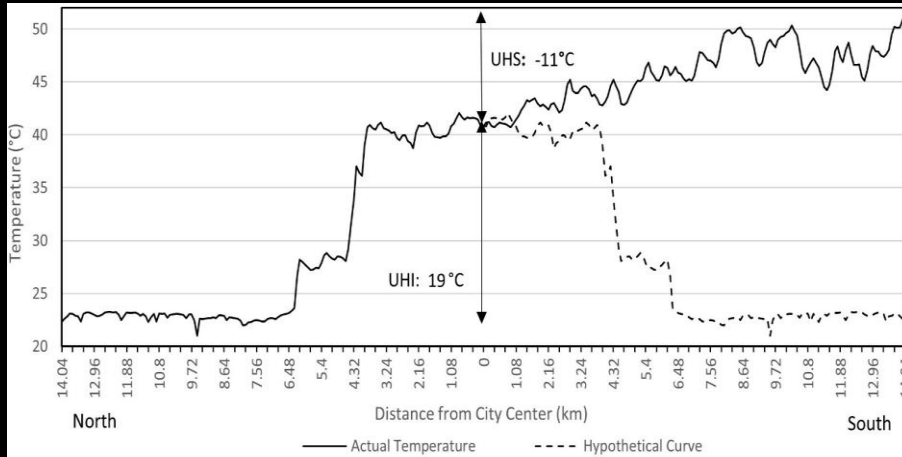




# Preliminary Results – Task 1



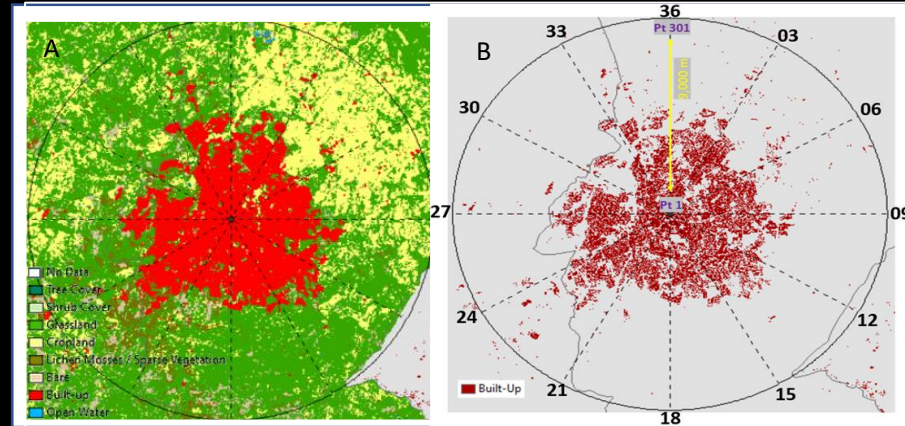
Land cover for the urban area of Casablanca



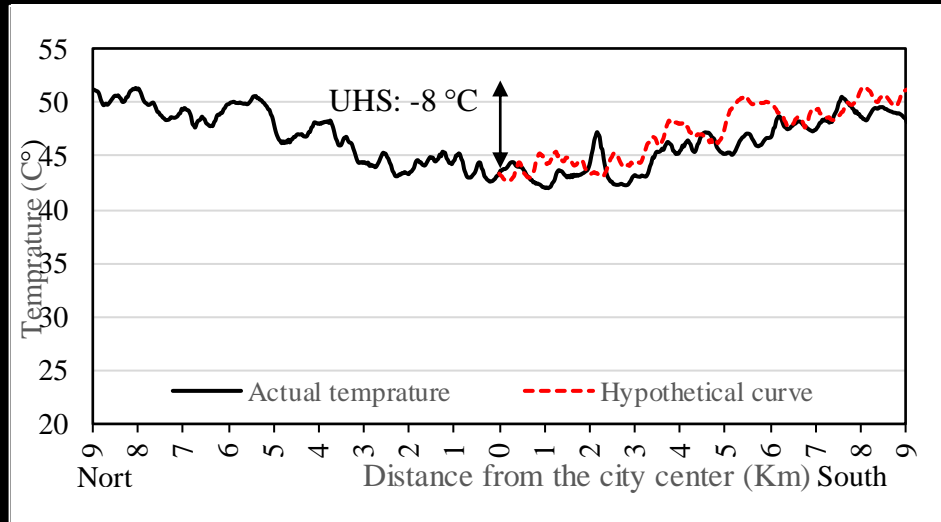
Surface temperature cross section along a north-south transect perpendicular to the coastline and across the city of Casablanca.

Surface temperature cross section along a northeast-southwest transect parallel to the coastline and across the city of Casablanca

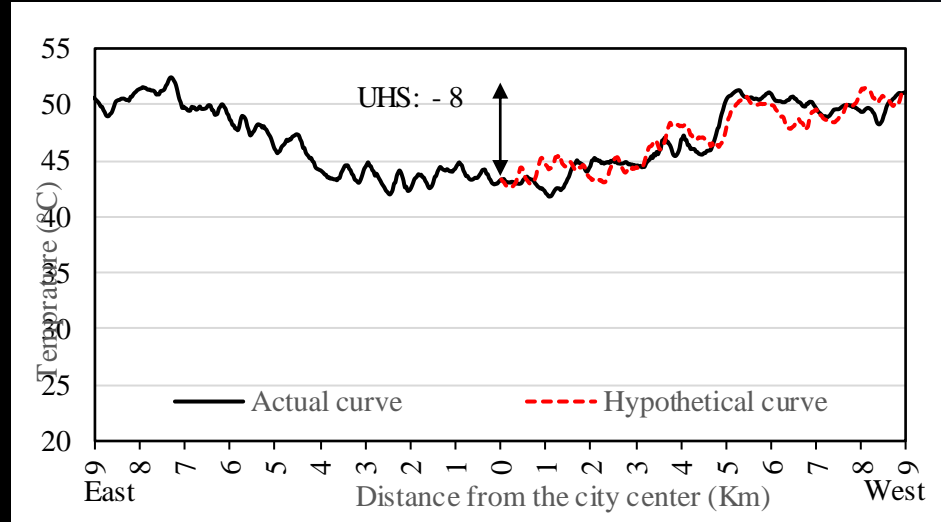
## Preliminary Results – Task 1



(A) Land cover classification in the region of Oujda, (B) Urban extension.



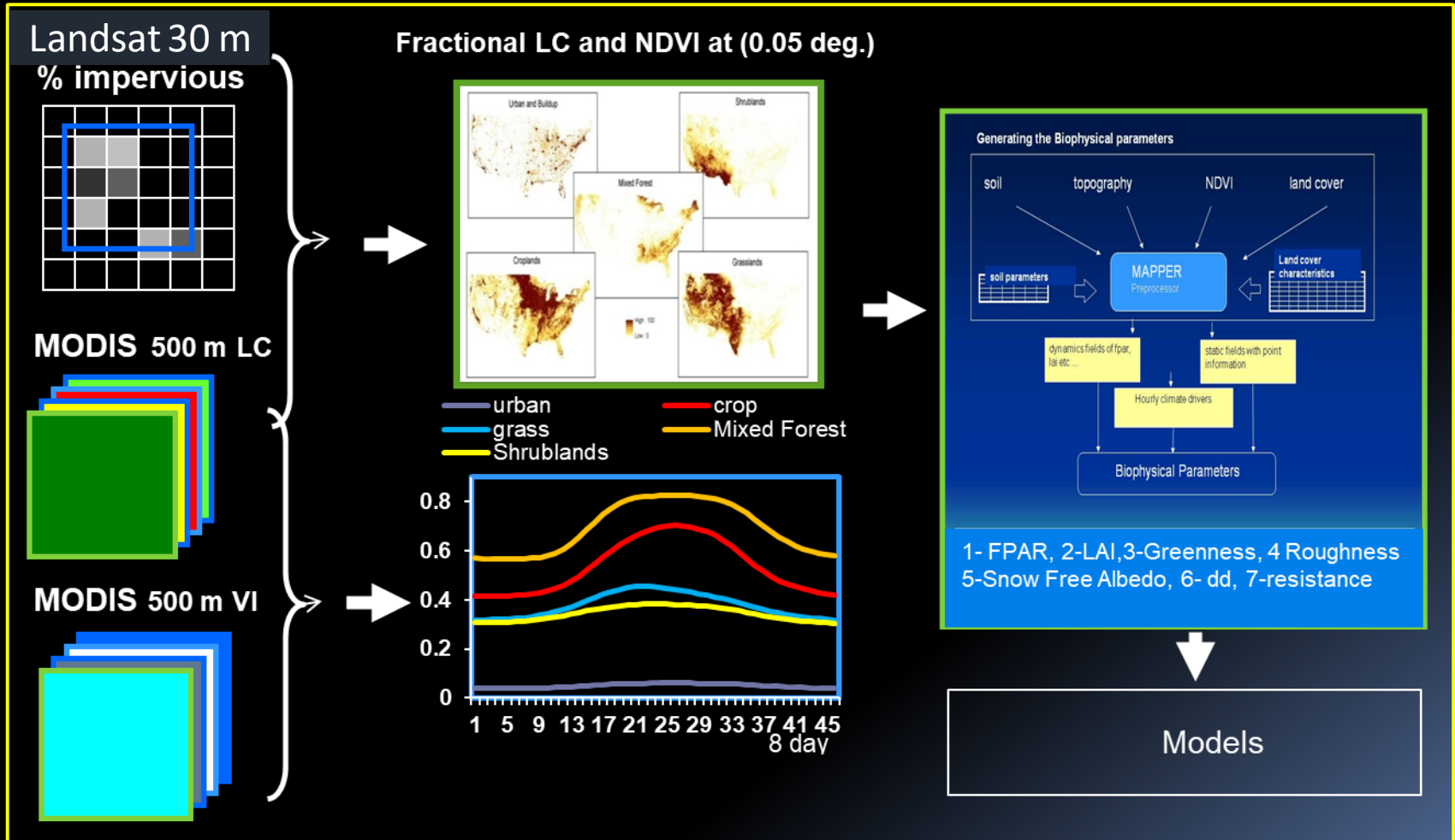
Surface temperature cross section along a North-South transect across Oujda



Surface temperature cross section along an East-West transect across Oujda

## Preliminary results task2

### Generating Land Use Maps and Biophysics parameters





## Preliminary results task2

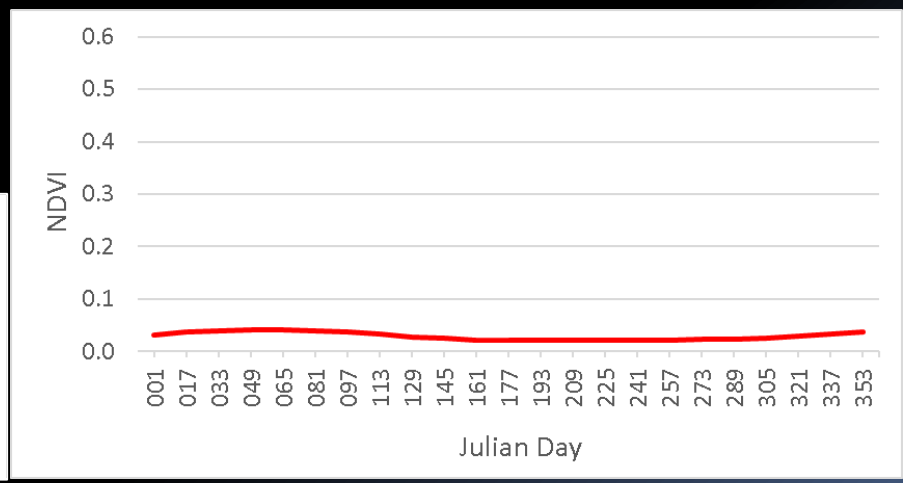
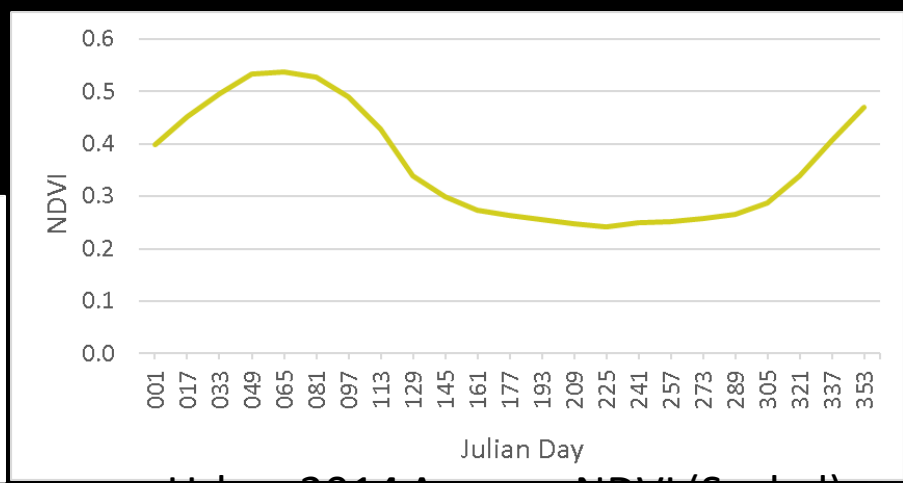
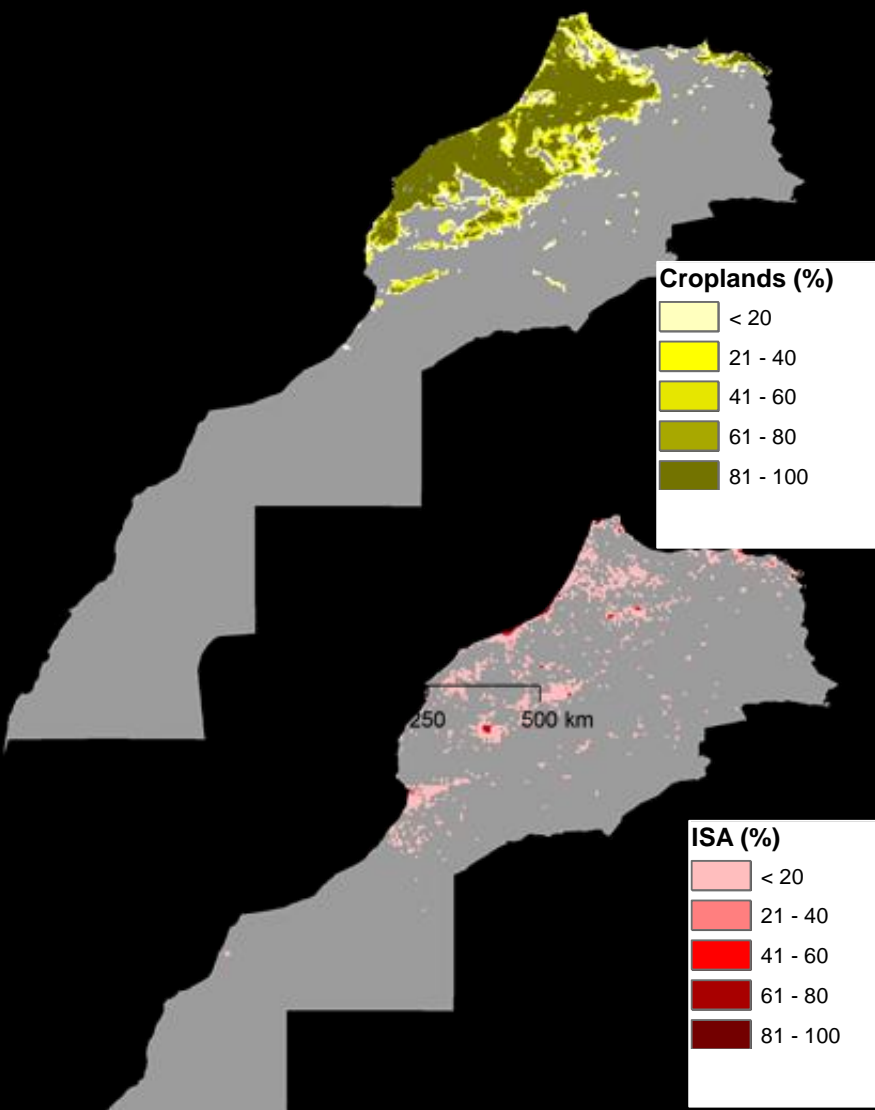


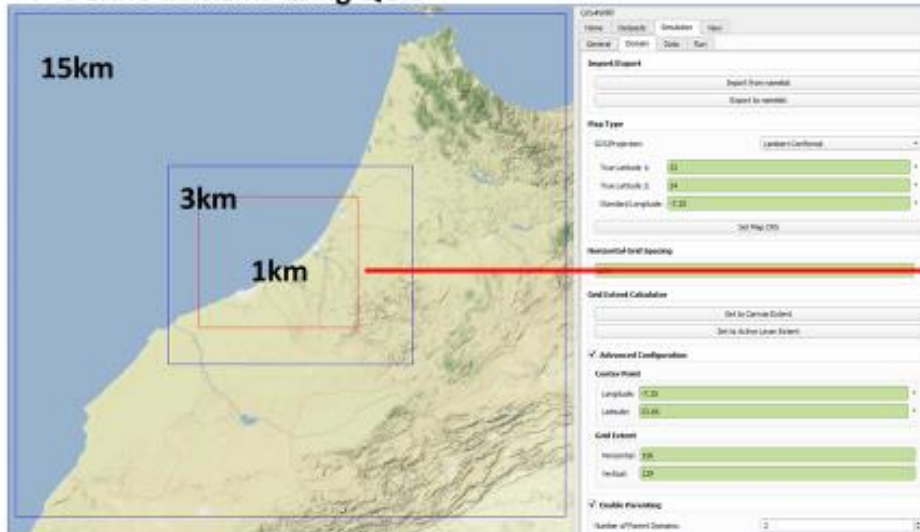
Figure 2023-05-08: NDVI (0-10)

...side is the same as the 1<sup>st</sup> one except I plotted the scaled-down (multiplied by 10) NDVI in the way we process it for the SiB2 model input.



## Preliminary results task3

### ❖ Define domains using QGIS



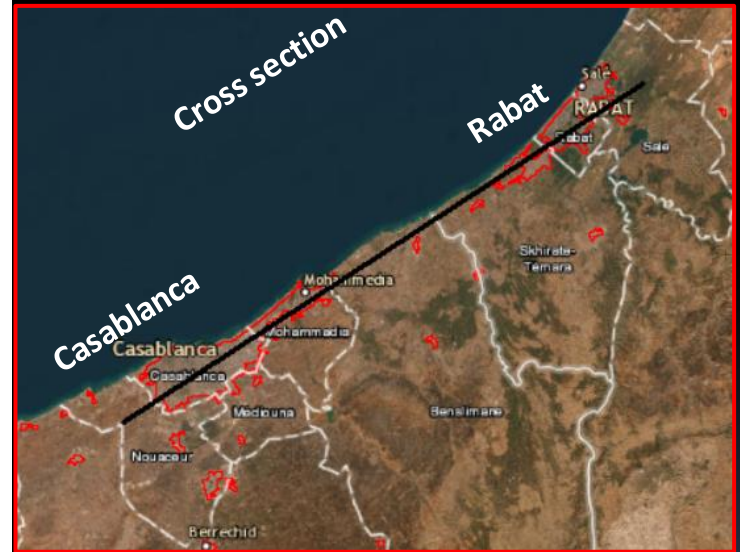
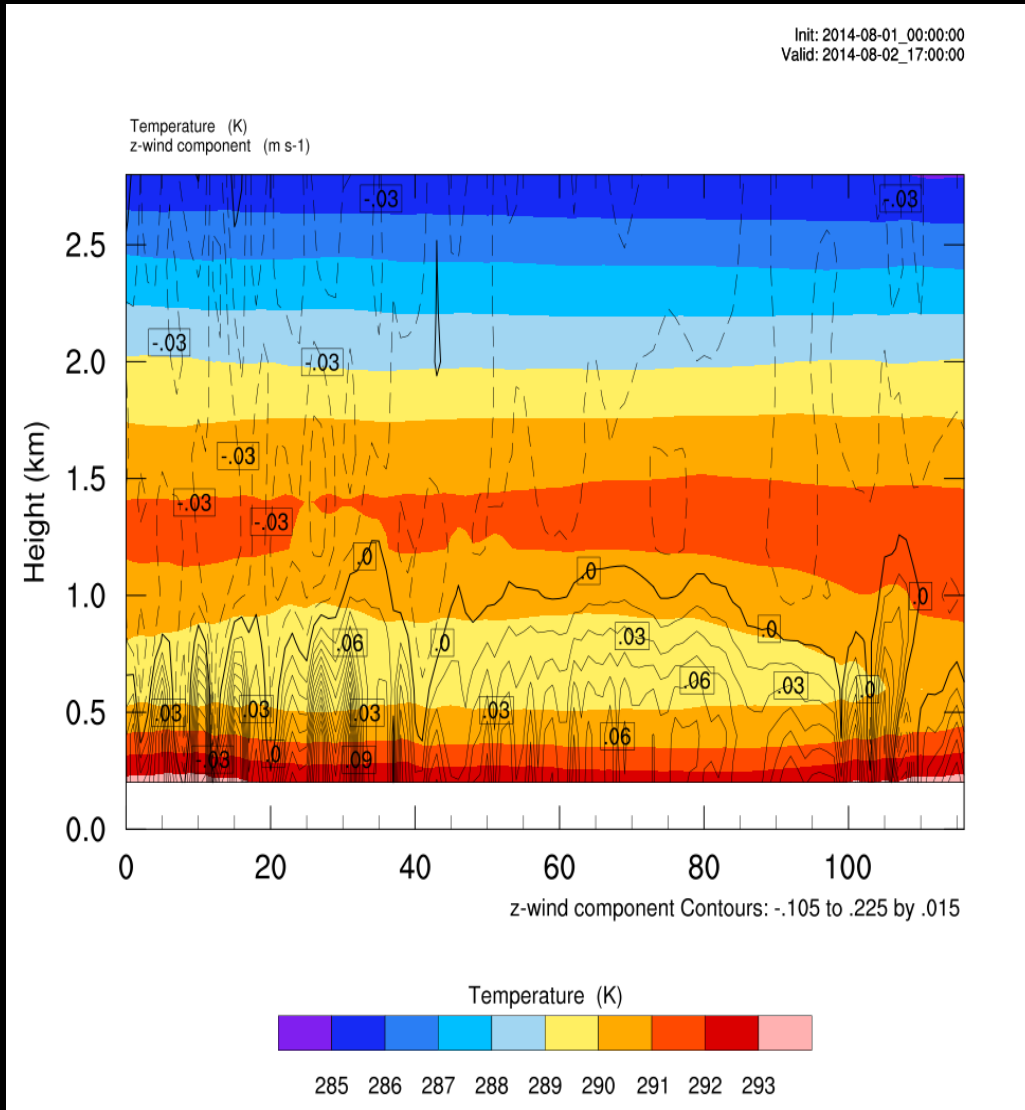
### ❖ Inner domain with 1km spatial resolution



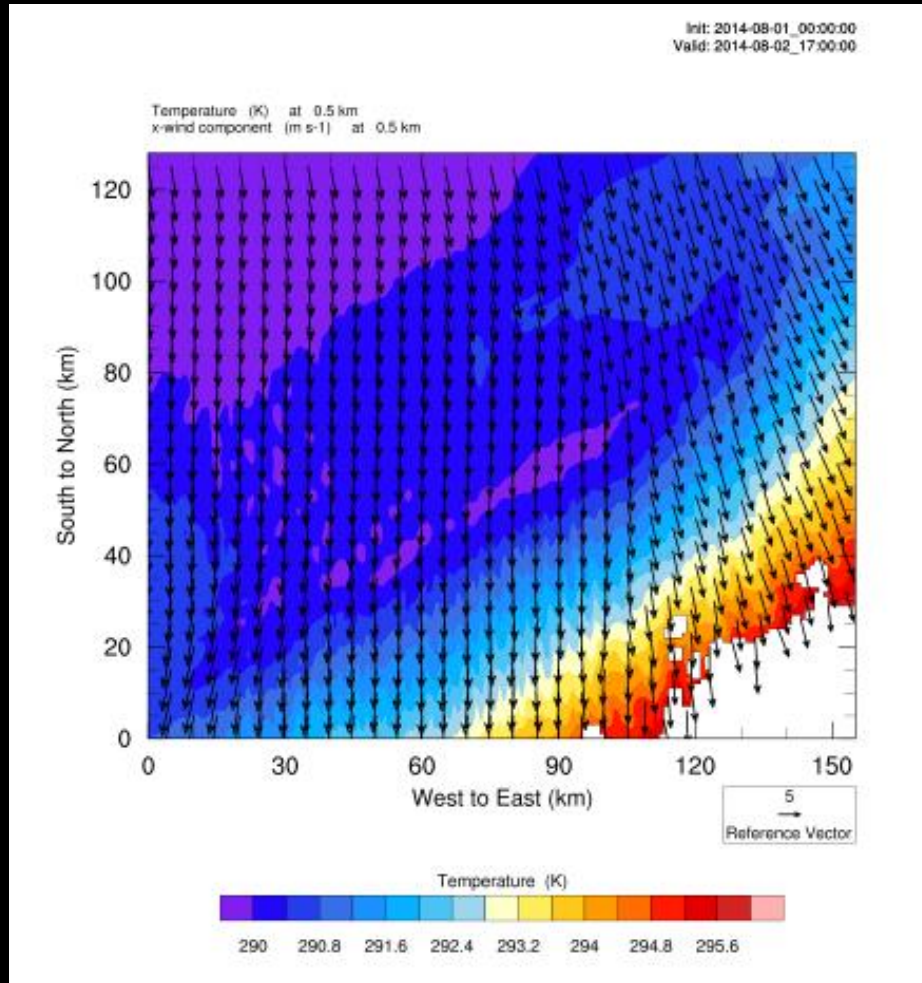
- ✓ Three domains with different resolutions: 15km, 3km, 1km
- ✓ Three cities are included: Casablanca, Mohammedia, Rabat
- ✓ Time periods: 2014-08-01 to 2014-08-03 GMT time
- ✓ One cross section across three coastal cities were analyzed in the inner domain with 1km spatial resolution



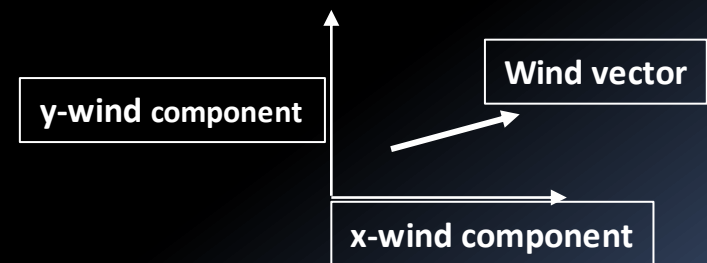
## Preliminary results task2



## Preliminary results task 3



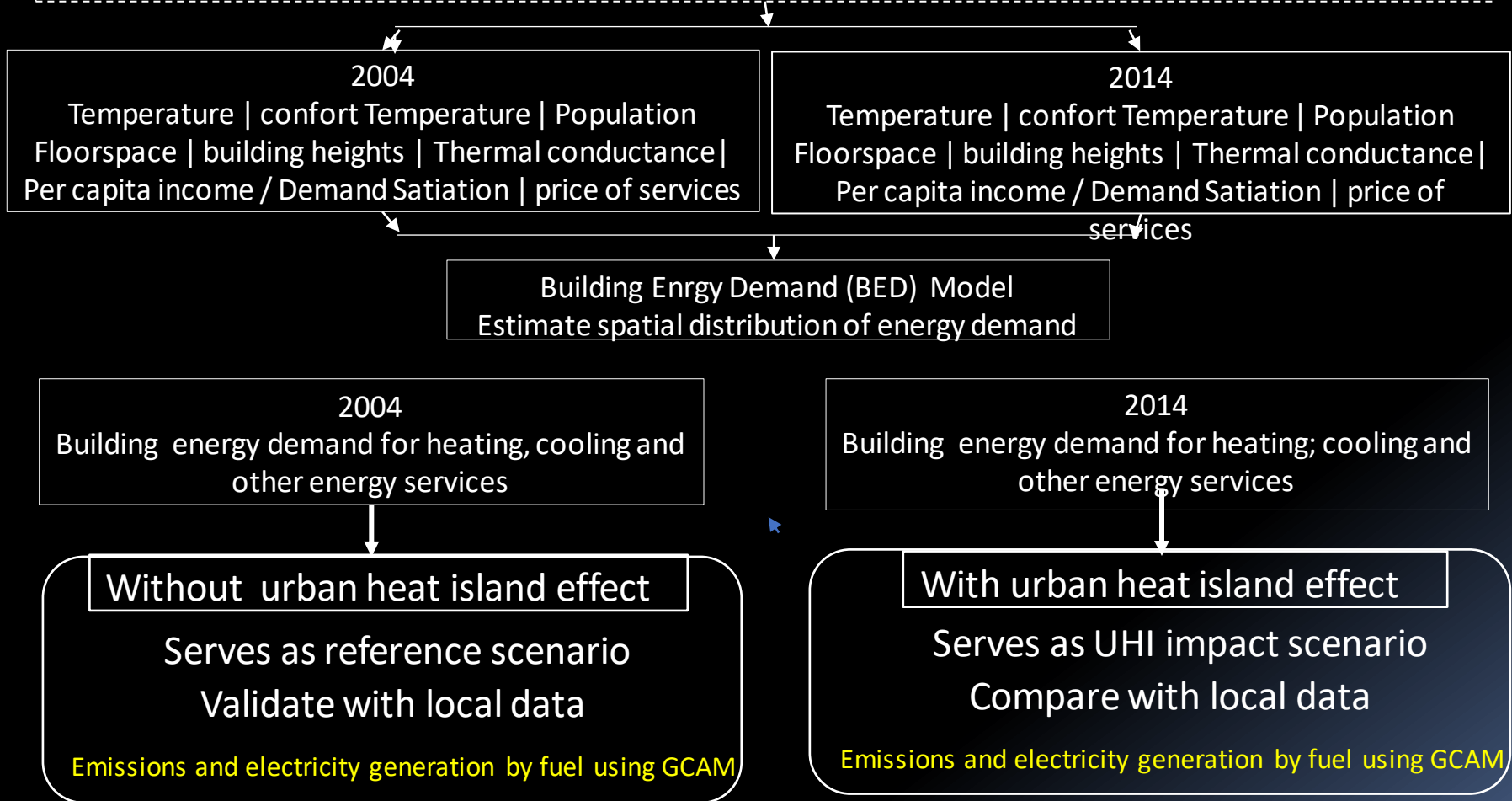
Sea breeze at 500m height at 17:00  
GMT on August 8, 2014





## Preliminary Results Task4

### inputs provided by Task 1,2 & 3



The objective of task 4 is to explore the impact of urban heat island (UHI)-induced changes in near-surface temperature and floor space on building energy heating and cooling demand, and how this shift will affect the corresponding electricity generation and emissions.





Land Cover Land Use Change Science Team meeting  
May 8-9, 2023

*Goddard*

- The proposal is in good shape
- Dynamic team working together
- Meeting monthly
- Expect all deliverables to be on time



End