# Establishing a pilot regional climate change web application tool for end-users

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# WP410 – Adaptation to Climate Change (ACC)

Leader: NOA
Participants: CEDARE, CUT, INOE, IPB, AOA
Duration: M9-M24

The ROI is one of the most sensitive and vulnerable to climate change regions on Earth. Task 410 envisages to consolidate EO platforms with atmospheric and climate models to mitigate the climate change and its side effects.

**The Ultimate Goal is:**
Provide the necessary support and coordination to **existing infrastructures**, to deliver consolidated information and knowledge for long term strategic planning on adaptation and mitigation to climate change and air quality for the RoI.

# Steps to achieve the goals of WP410

## General key objectives

Collection, homogenization, archiving and integration of EO atmospheric data

⬇

**Establishment of a GEO-CRADLE Regional Data Hub**

**CLIMATE**
Regional climate models and climate data for past and future climate

⬇

Support decision makers on climate change mitigation and adaptation policies

**WEATHER**
Weather forecast models and near real time observations

⬇

Support local authorities and citizens awareness in weather extremes (heat waves, floods, storms, etc)

**AIR QUALITY**
Air quality forecast models and near real time observations

⬇

Support local authorities and citizens awareness in air quality exceedances (PM, ozone, Desert dust, fire smoke, volcanic ash, etc)

**Establishment of relevant regional pilot studies**

# User needs for ACC

- The survey analysis indicated various levels of maturity regarding climate change awareness and EO/model data needs among the partner countries.

- A need for reliable open access weather and climate data is expressed by all countries of the RoI. Specific meteorological and climatic variables are requested, such as: air temperature, humidity, wind speed and direction ,precipitation, cloud cover, solar radiation, water evaporation and humidity evapotranspiration.

- For ACC is essential the use of future climate data from model projections.

- It is also essential the use of high resolution model projections for the RoI based on RCMs.

- Ensemble versus individual information is also important for uncertainty estimates.

- Plenty of open access data in databases (CORDEX, ENSEMBLES, PRUDENCE) but restricted usability from non-experts.

- **There is need for establishing a user friendly regional climate change web application tool for end-users.**
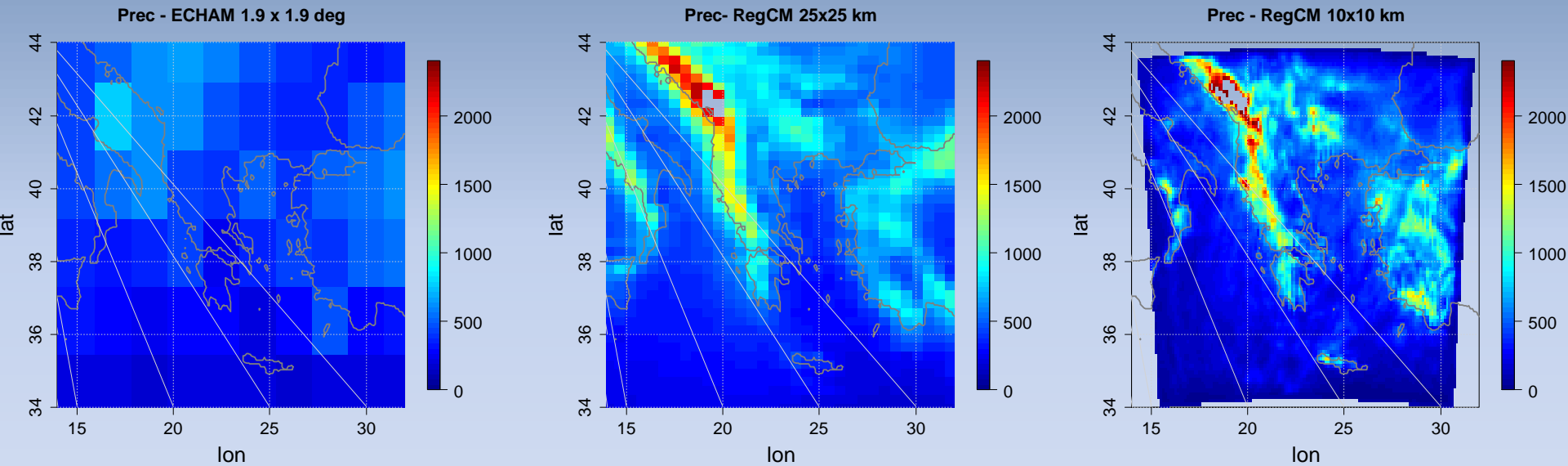
# Regional Climate Modeling:

- Technique: A "Regional Climate Model" (RCM) is "nested" within a GCM in order to increase the resolution of a climate simulation.
  - Initial conditions (IC) and lateral boundary conditions (LBC) for the RCM are obtained from the GCM.
- Strategy: The GCM is used to simulate the response of the general circulation to large scale forcings, while the RCM is used to simulate the effect of sub-GCM-grid scale forcings and to provide fine scale regional information.
  - The RCM is intended to only enhance the GCM information
- Technique inherited from NWP
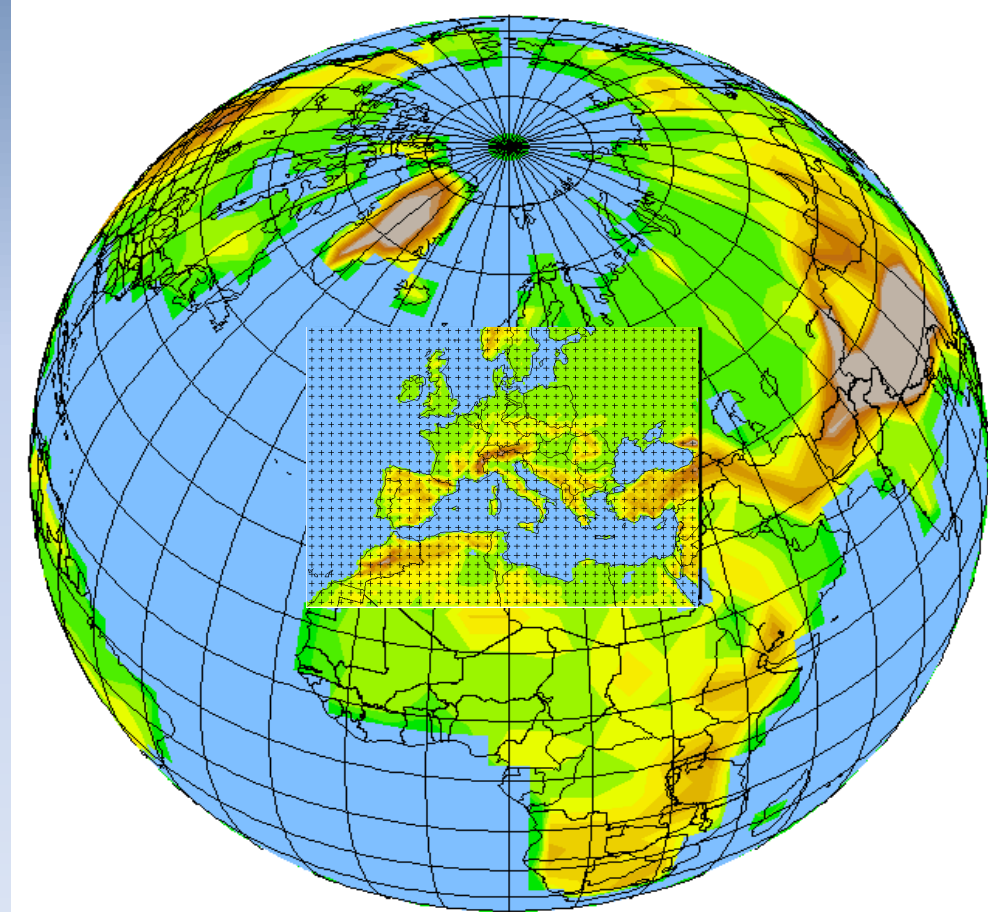
# Modelled precipitation climatology (1975-2000) based on GCMs and RCMs: The effect of resolution



Prec - ECHAM 1.9 x 1.9 deg

Prec- RegCM 25x25 km

Prec - RegCM 10x10 km

**Source: Zanis et al., A transient high resolution regional climate simulation for Greece for the period 1960-2100: Evaluation and future projections, Climate Research, 64: 123–140, doi:10.3354/cr01304, 2015**

# ACC Pilot structure

## General key objectives

**Establishment of relevant regional pilot studies**

**PILOT 1:** Establishing a pilot regional climate change web application tool

**PILOT 2:** Strengthening the interplay between the Earth Observing System and modeling activities for weather, air quality and climate

Support end-users and decision makers on climate change mitigation and adaptation policies

Use of satellite data for optimization and assimilation in regional climate models and weather forecast models

# GEOCLIMA
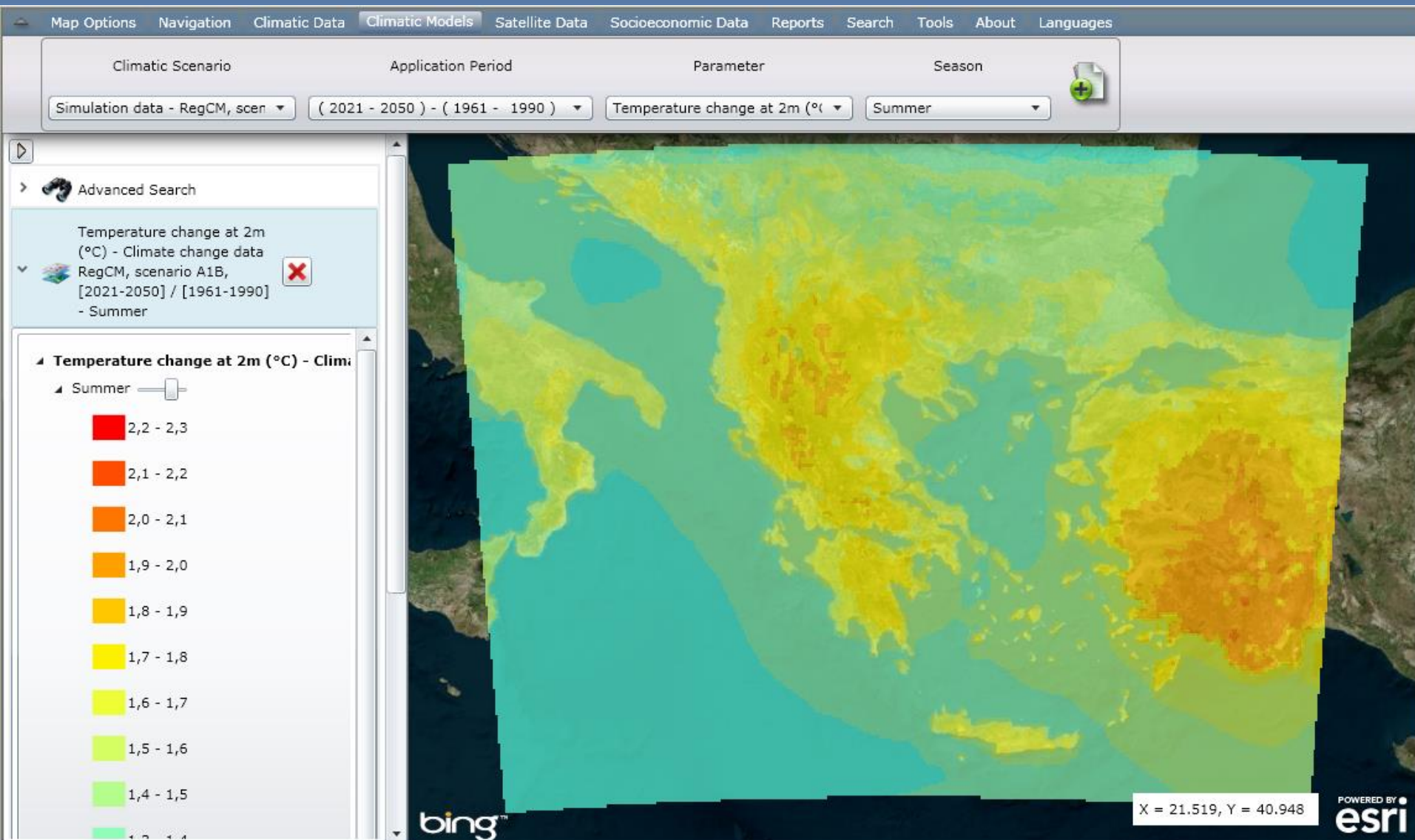


**Coordination: Department of Meteorology and Climatology, Aristotle University of Thessaloniki**

# Regional Climate application tool

**PILOT1: Set up a user friendly interactive web application tool for end users to retrieve climate variables and climate change information from high resolution regional climate projections**

**STEP 1:** Set up a regional high resolution database (0.11° × 0.11°) including climate projections for a number of climate variables from various Regional Climate Models (RCM) and emission scenarios (data source: EURO-CORDEX: http://www.euro-cordex.net/).

**STEP 2:** Set up a database with secondary climate indices relevant to specific sectors of interest and tailored to end-user needs.

**STEP 3:** Set up an interactive web application for retrieving time series of the relevant climate variables and indices following a selection tree:
- *Selection of PARAMETER/VARIABLE (e.g. climate variables or climate indices)*
- *Selection of FREQUENCY (e.g. month, year)*
- *Selection of TIME FRAME (e.g. present / future time slice)*
- *Selection of EXPERIMENT/SCENARIO (e.g. hindcast, RCP26, RCP45, RCP85)*
- *Selection of MODELS (e.g. RegCM, WRF, ensemble)*
- *Selection of the LOCATION (lat, lon)*

# Regional Climate application tool

## Indicative list of Climate variables and indices

| Climate Indices | | Relevance |
|---|---|---|
| CI1 | Mean near surface temperature | Fundamental |
| CI2 | Precipitation rate | Fundamental |
| CI3 | Maximum near surface temperature | Fundamental, extremes |
| CI4 | Minimum near surface temperature | Fundamental, extremes |
| CI5 | Wind speed at 10m, 50m, 100m and 200m | Fundamental, Energy, natural disasters |
| CI6 | Surface absorbed solar radiation | Fundamental, Energy, Tourism, Agriculture |
| CI7 | 95th percentile of rain day amounts | Extremes, natural disasters |
| CI8 | 95th percentile of wind speed at 10 m | Extremes, natural disasters |
| CI9 | Annual greatest 5-day total rainfall | Extremes, natural disasters |
| C10 | Fraction % of total rainfall from events> long-term P90 | Extremes, natural disasters |
| C11 | Number of events > long-term 90th percentile of rain days | Extremes, natural disasters |
| CI12 | Number of frost days Tmin < 0 degC | Extremes |
| CI13 | Heat Wave Duration Index | Agriculture,Tourism |
| CI14 | Standardized Precipitation Index (SPI) | Agriculture,Water resources |
| CI15 | Potential evaporation | Agriculture |
| CI16 | Growing season duration (GSD) | Agriculture |
| CI17 | Tourism Climate Index (TCI) | Tourism |
| CI18 | Snow depth (SnowD) | Tourism |
| CI19 | Heating Degree Day (HDD) | Energy |
| CI20 | Cooling Degree Day (CDD) | Energy |

# RCM projections EURO-CORDEX 1950-2100
## http://www.euro-cordex.net/



Cordex European Domain (E-11)
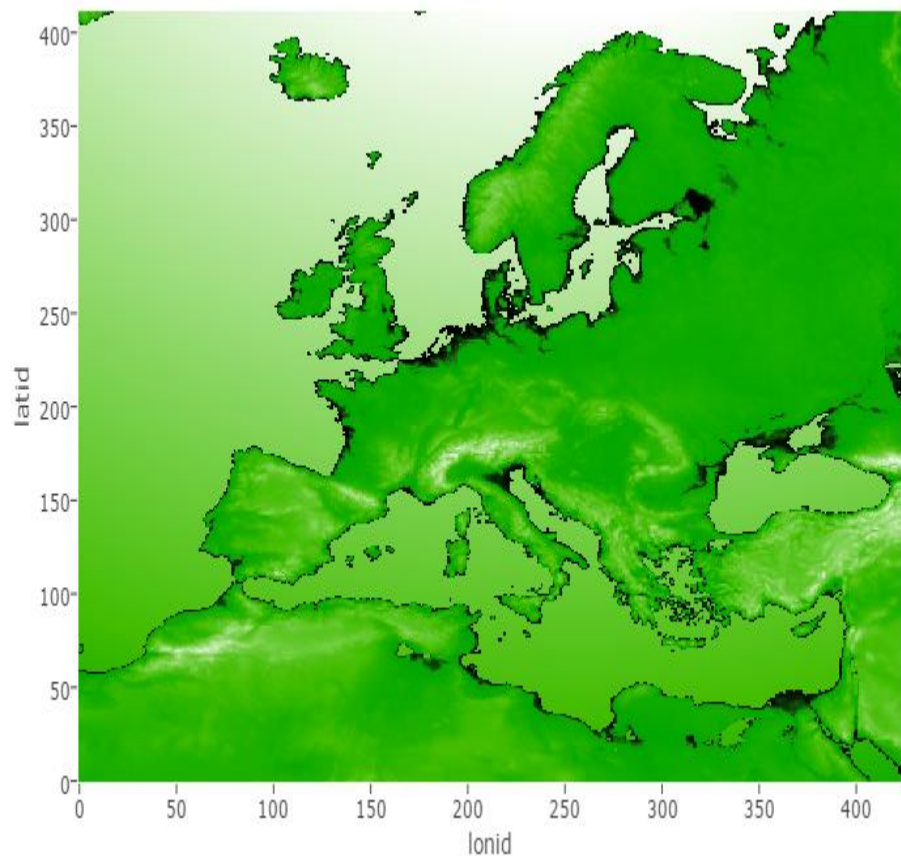
| Scenario | GCMModel | RCMModel |
|---|---|---|
| rcp26 | CNRM-CERFACS-CNRM-CM5 | CNRM-ALADIN53 |
| rcp26 | MPI-M-MPI-ESM-LR | MPI-CSC-REMO2009 |
| rcp45 | CNRM-CERFACS-CNRM-CM5 | CLMcom-CCLM4-8-17 |
| rcp45 | CNRM-CERFACS-CNRM-CM5 | CNRM-ALADIN53 |
| rcp45 | ICHEC-EC-EARTH | KNMI-RACMO22E |
| rcp45 | IPSL-IPSL-CM5A-MR | IPSL-INERIS-WRF331F |
| rcp45 | IPSL-IPSL-CM5A-MR | SMHI-RCA4 |
| rcp45 | MOHC-HadGEM2-ES | CLMcom-CCLM4-8-17 |
| rcp45 | MOHC-HadGEM2-ES | SMHI-RCA4 |
| rcp45 | MPI-M-MPI-ESM-LR | CLMcom-CCLM4-8-17 |
| rcp45 | MPI-M-MPI-ESM-LR | MPI-CSC-REMO2009 |
| rcp85 | CNRM-CERFACS-CNRM-CM5 | CLMcom-CCLM4-8-17 |
| rcp85 | CNRM-CERFACS-CNRM-CM5 | CNRM-ALADIN53 |
| rcp85 | ICHEC-EC-EARTH | KNMI-RACMO22E |
| rcp85 | IPSL-IPSL-CM5A-MR | IPSL-INERIS-WRF331F |
| rcp85 | IPSL-IPSL-CM5A-MR | SMHI-RCA4 |
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| rcp85 | MPI-M-MPI-ESM-LR | CLMcom-CCLM4-8-17 |
| rcp85 | MPI-M-MPI-ESM-LR | MPI-CSC-REMO2009 |

# Welcome to climate-projection beta

# [http://climate-projection.weebly.com/](http://climate-projection.weebly.com/)
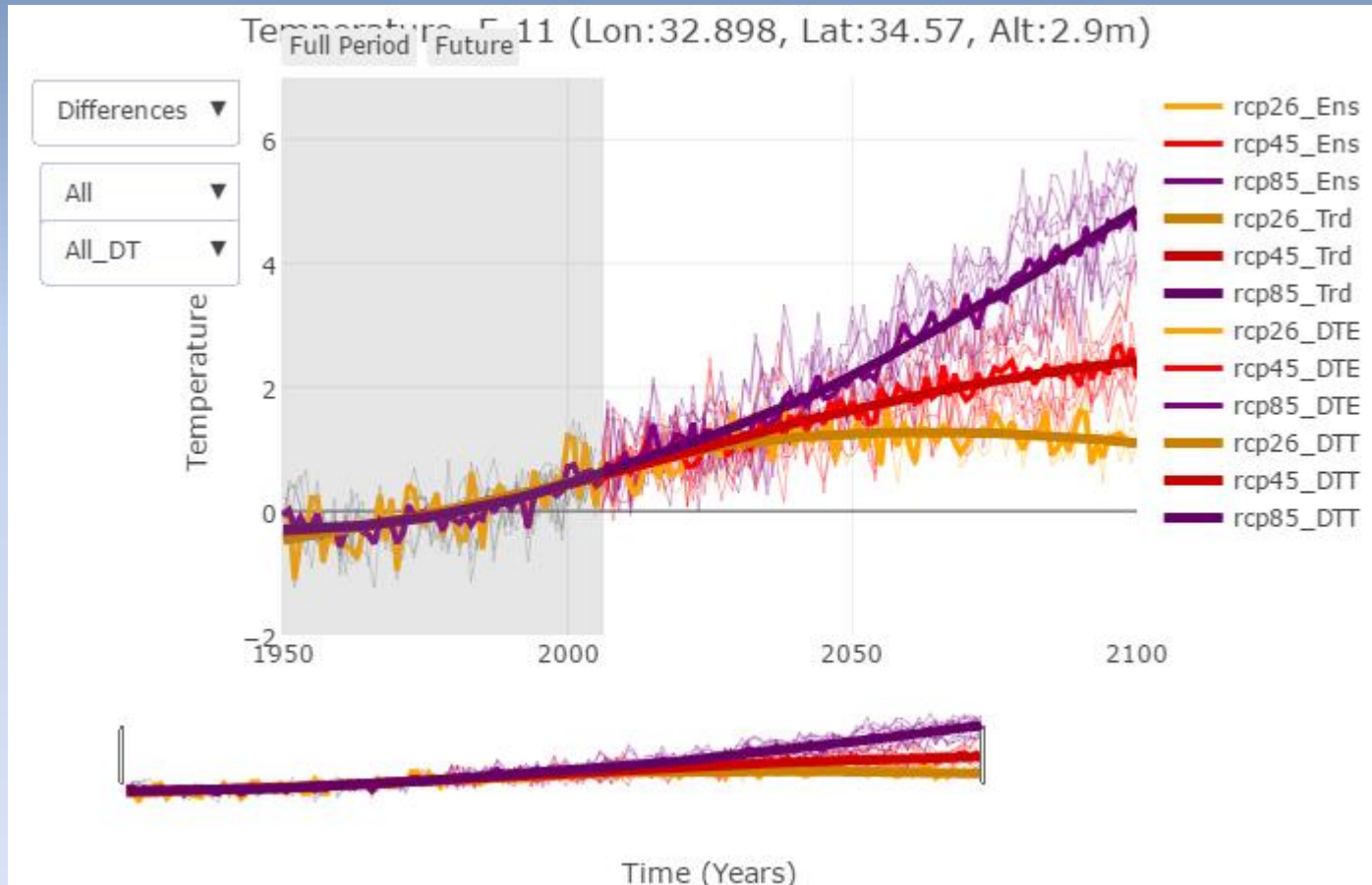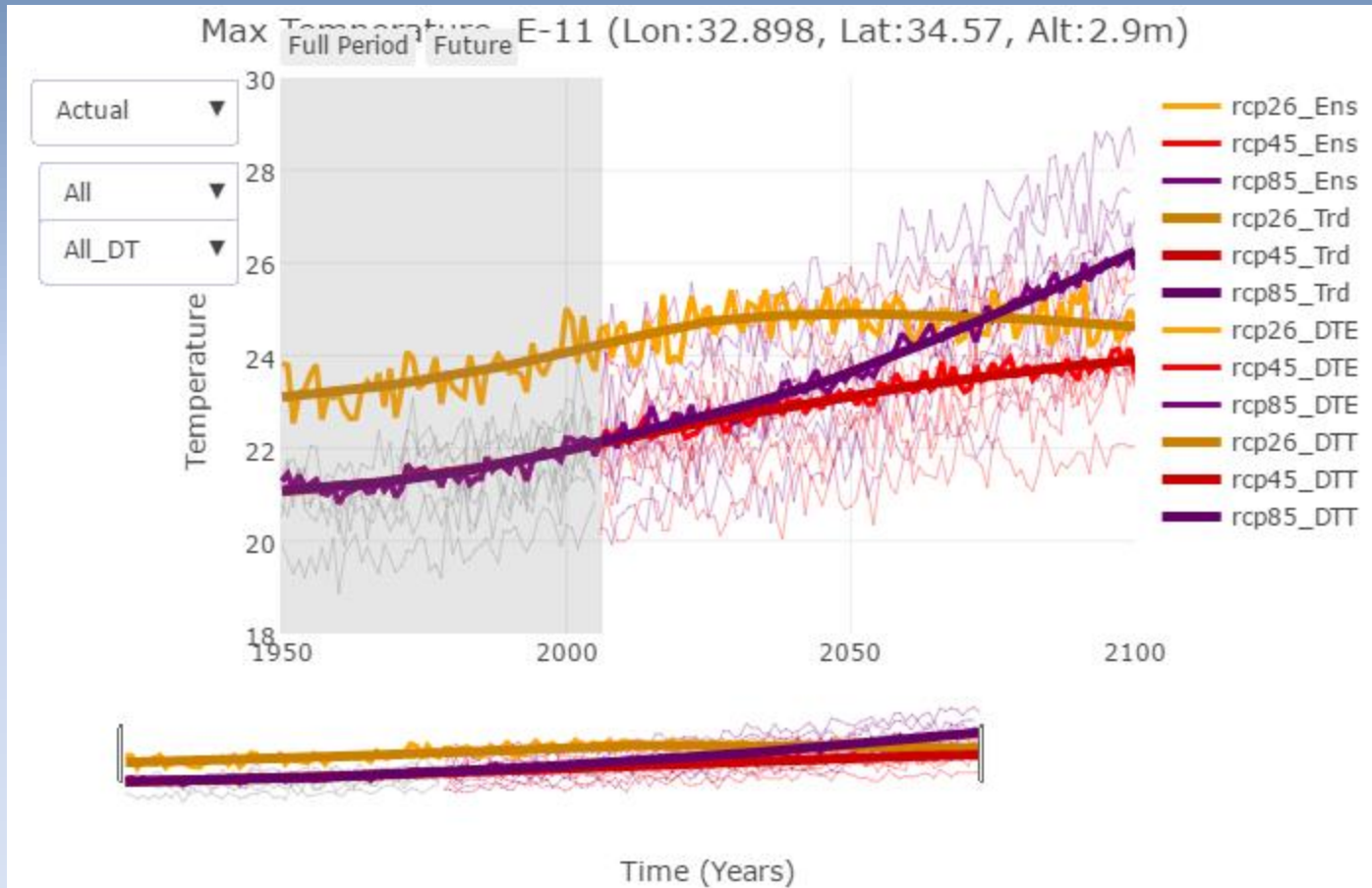
# Temperature Projections - Limassol
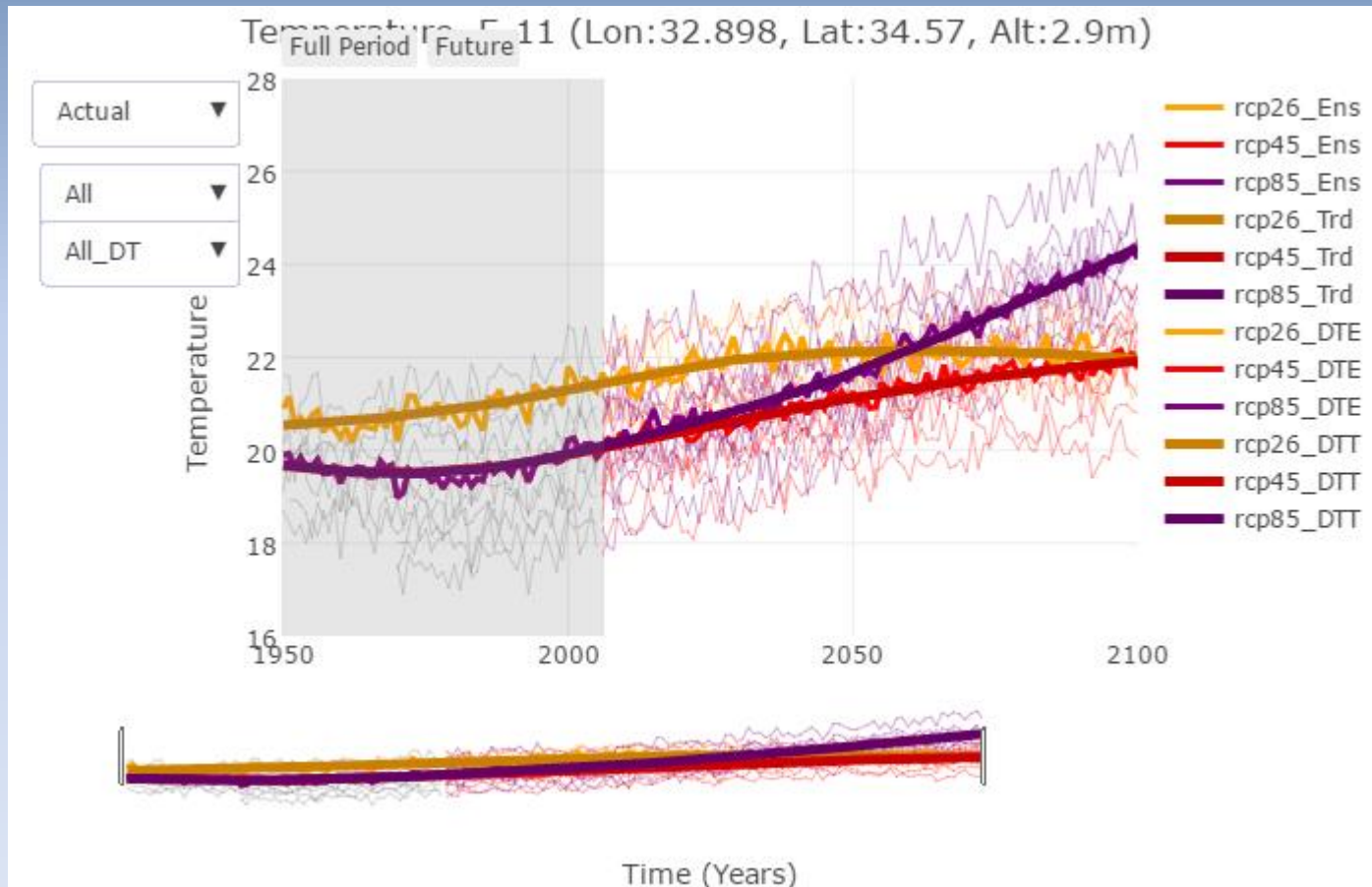
# Temperature Difference Projections - Limassol

# Max Temperature Projections - Limassol



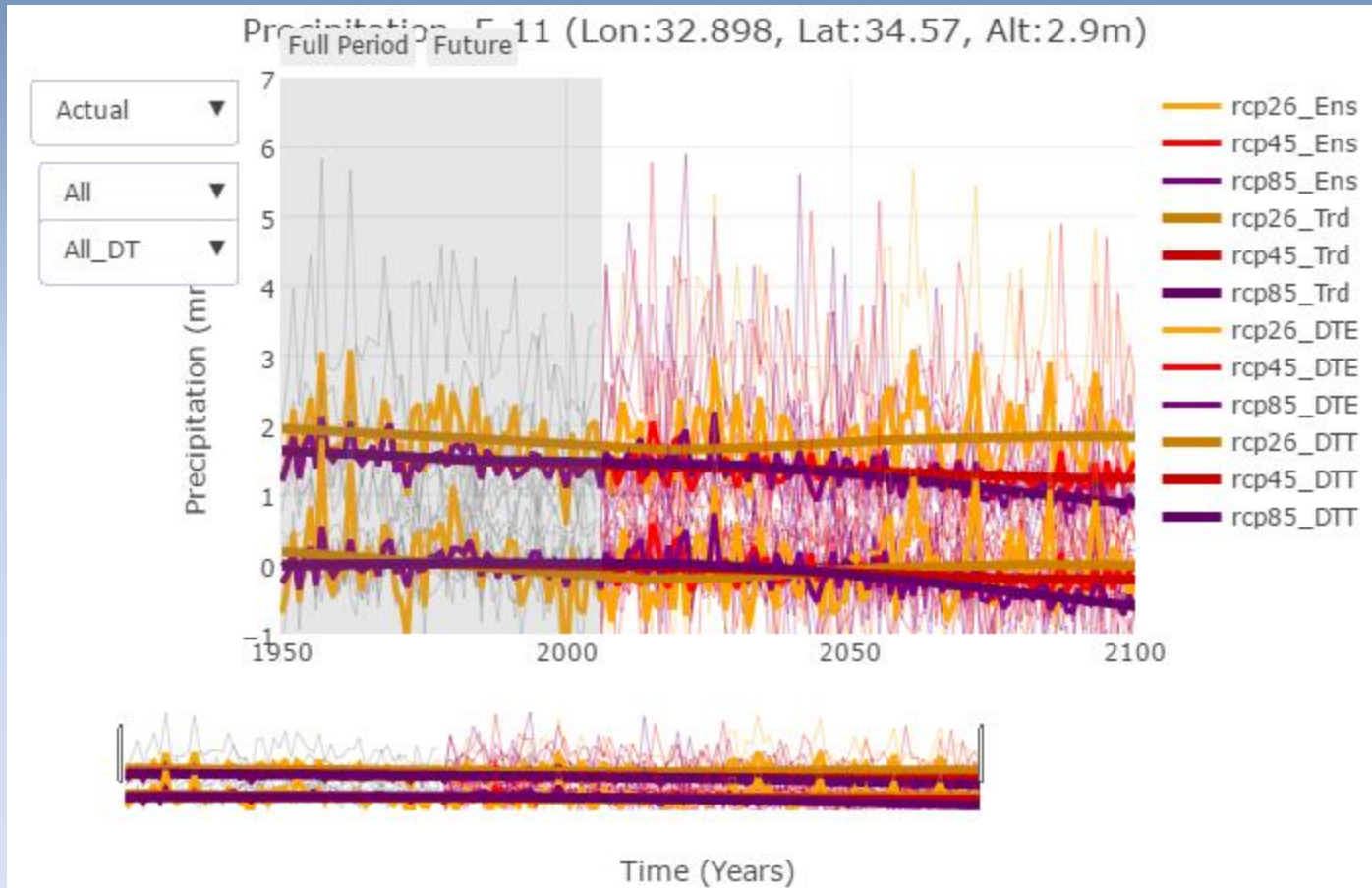Max Temperature E-11 (Lon:32.898, Lat:34.57, Alt:2.9m)

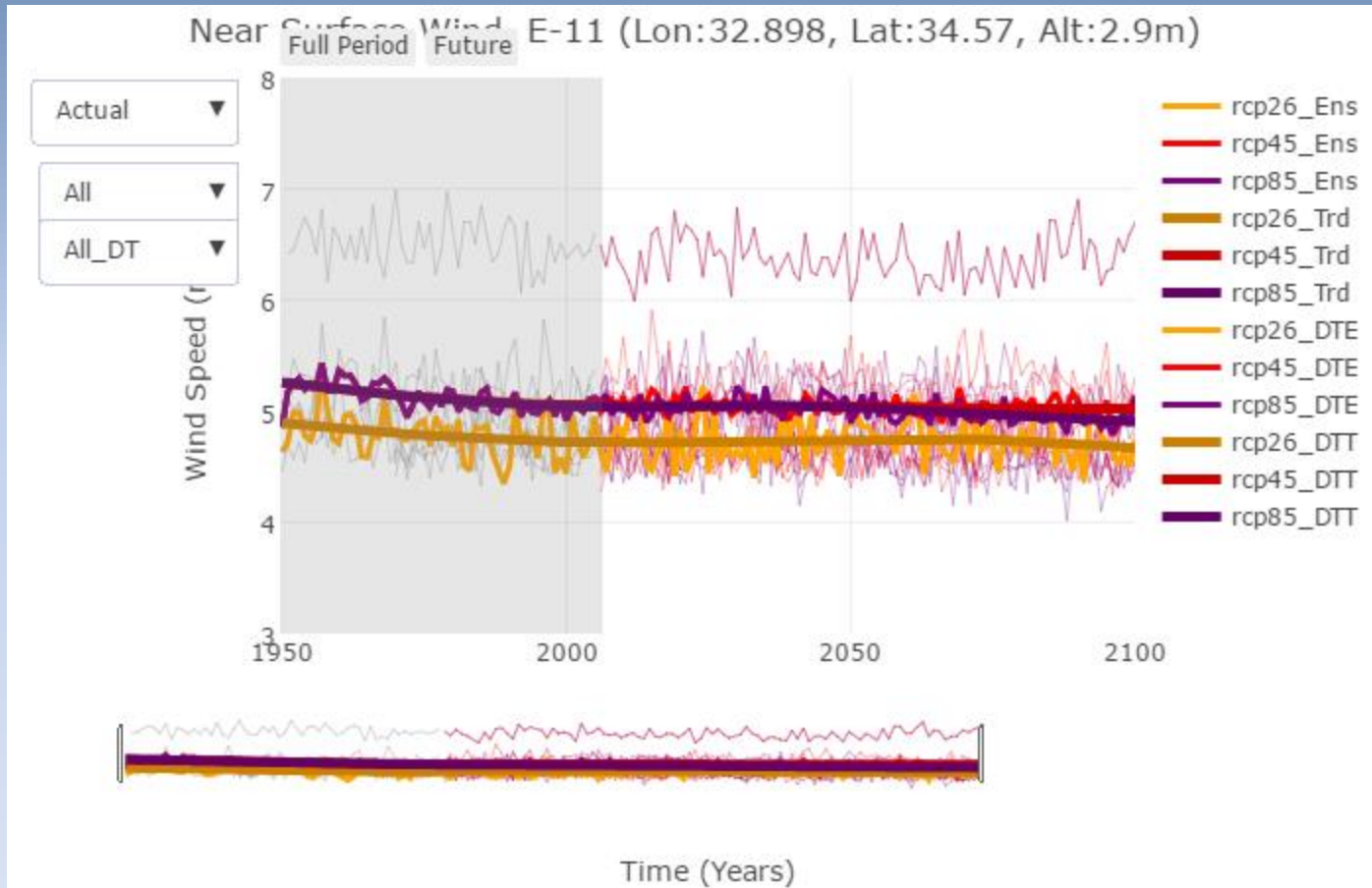# Min Temperature Projections - Limassol
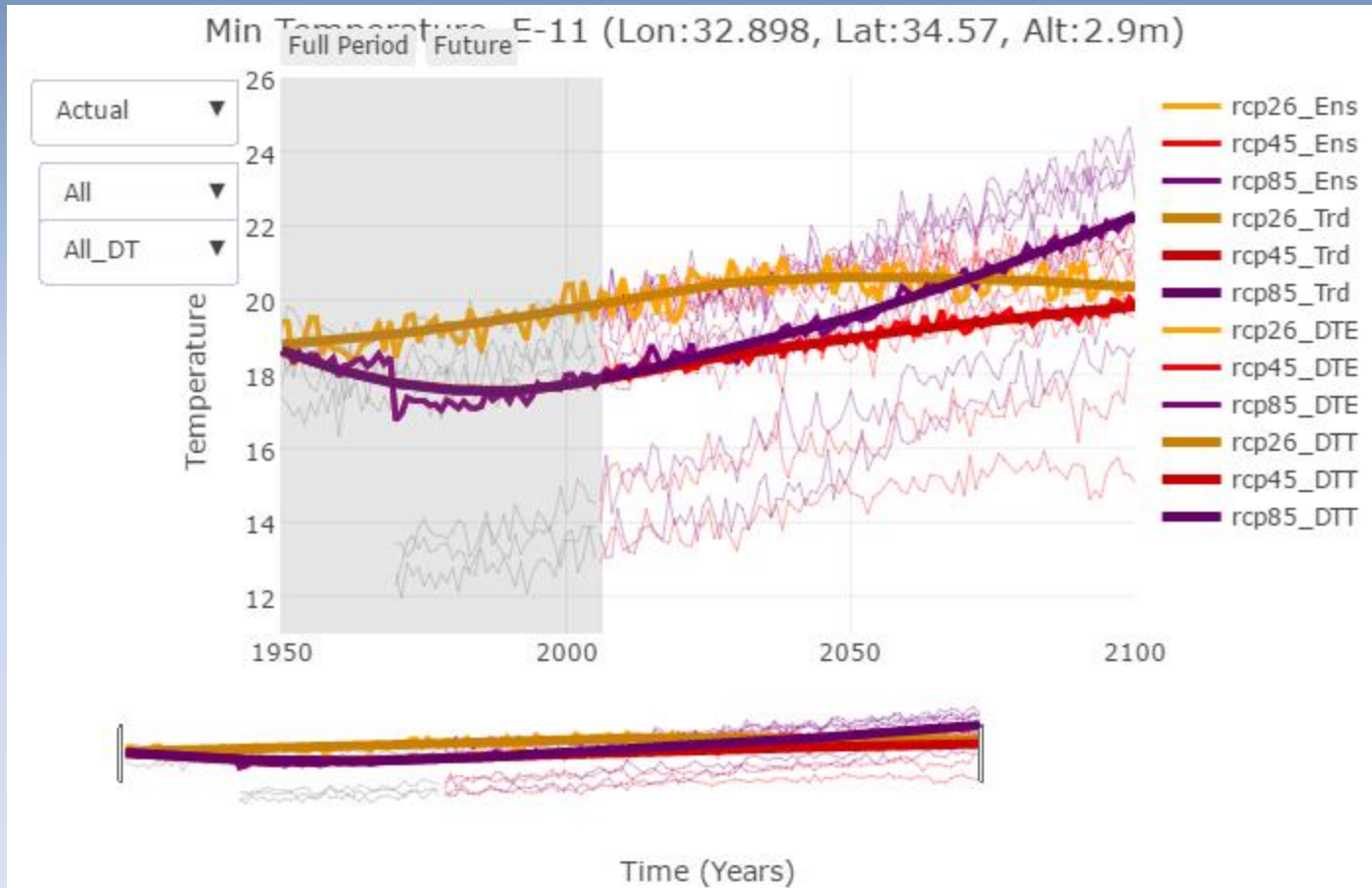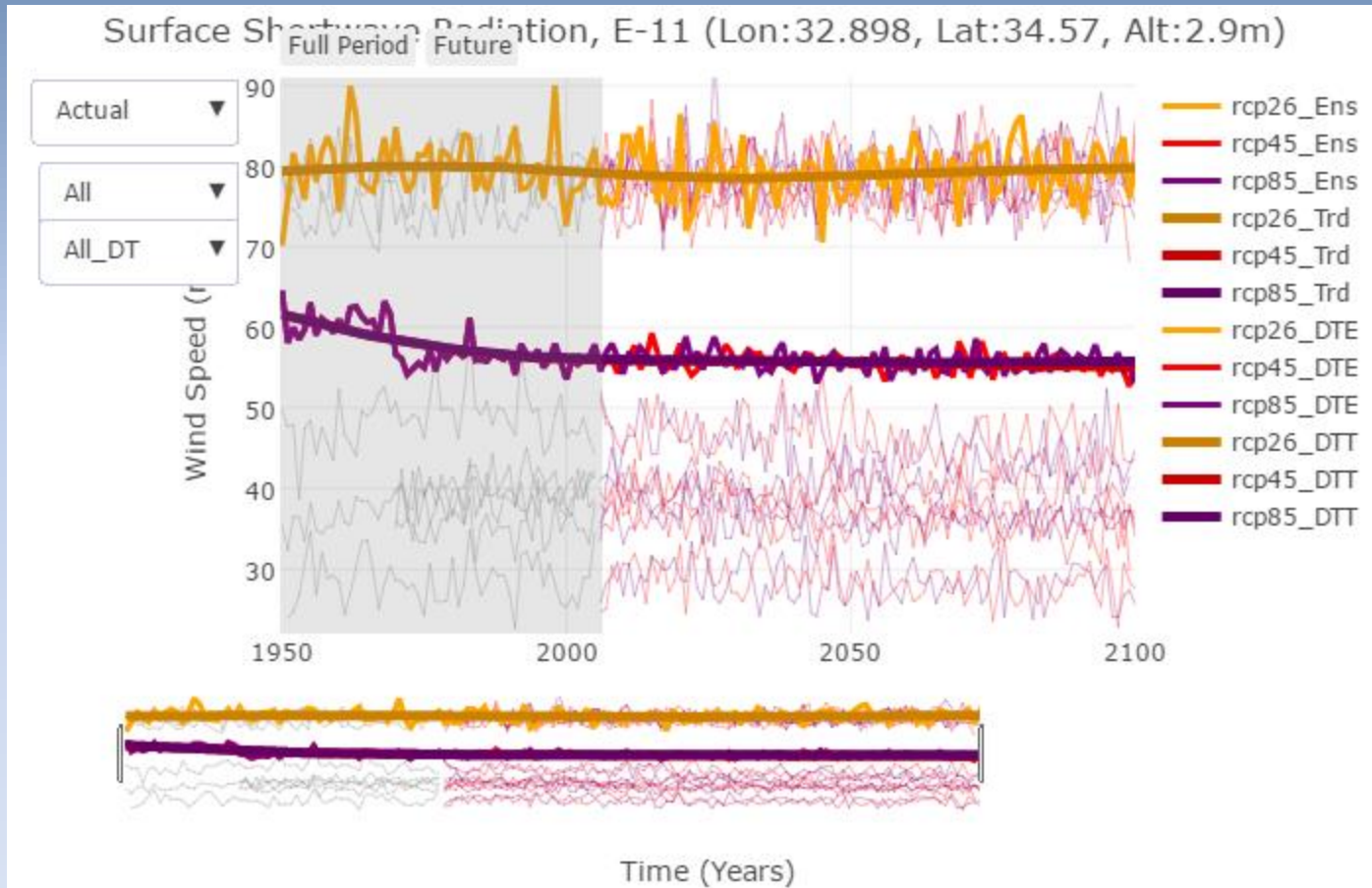
# Precipitation Projections - Limassol

# Wind Speed 10m Projections - Limassol

# Incoming Shortwave Radiation Projections - Limassol

# Thanks for your attention