



Climate Change

User Workshop on Regional Reanalysis

Availability of SURFEX-MESCAN data

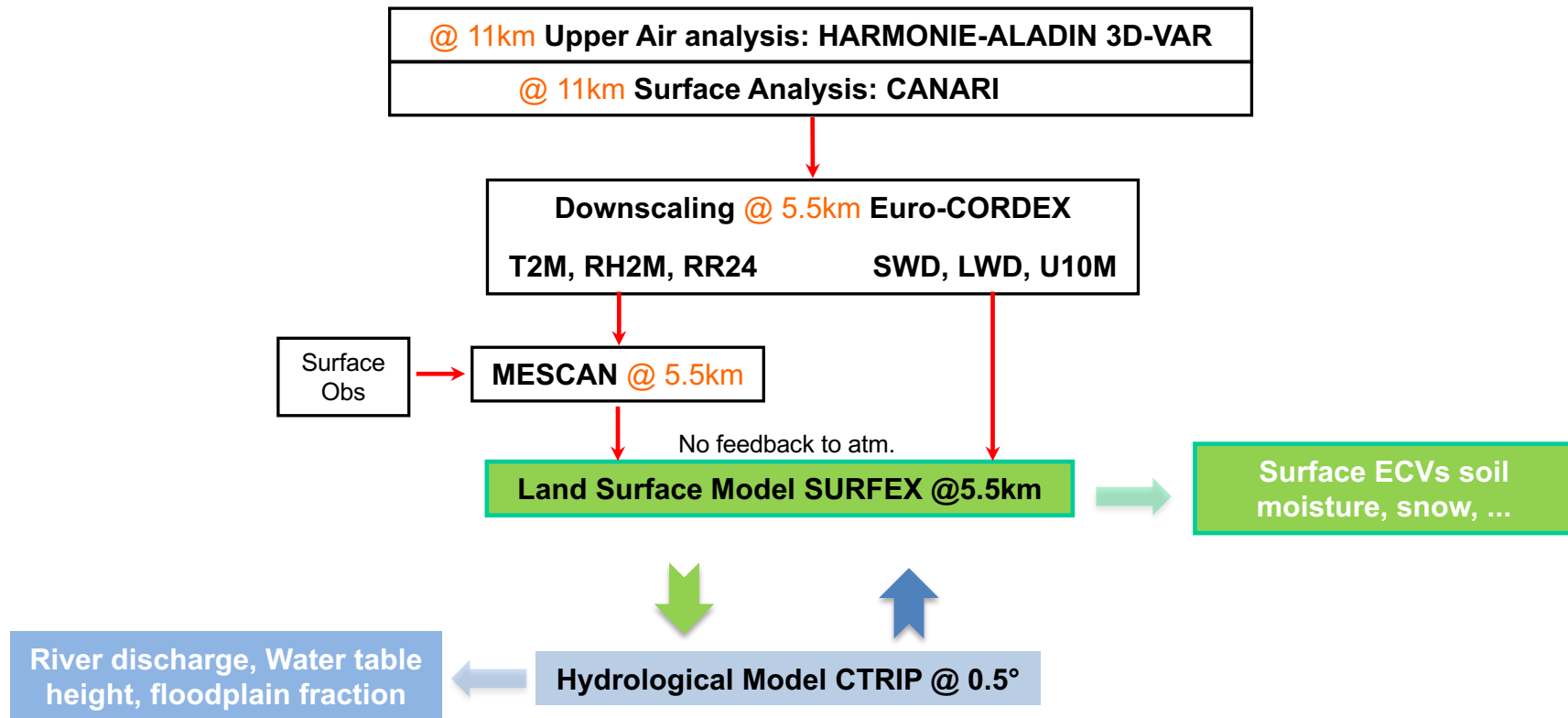
Patrick Le Moigne *et al.*





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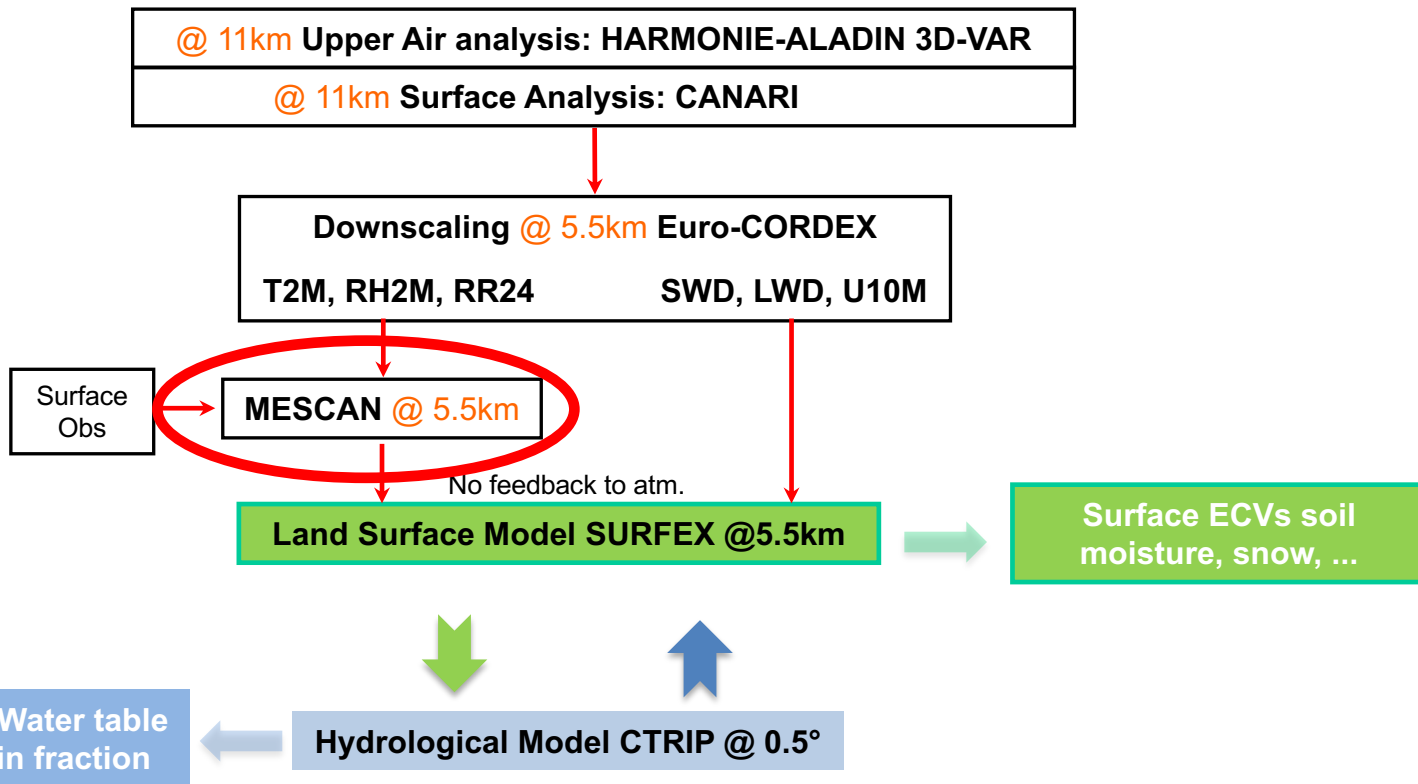
UERRA Schematic





Climate
Change

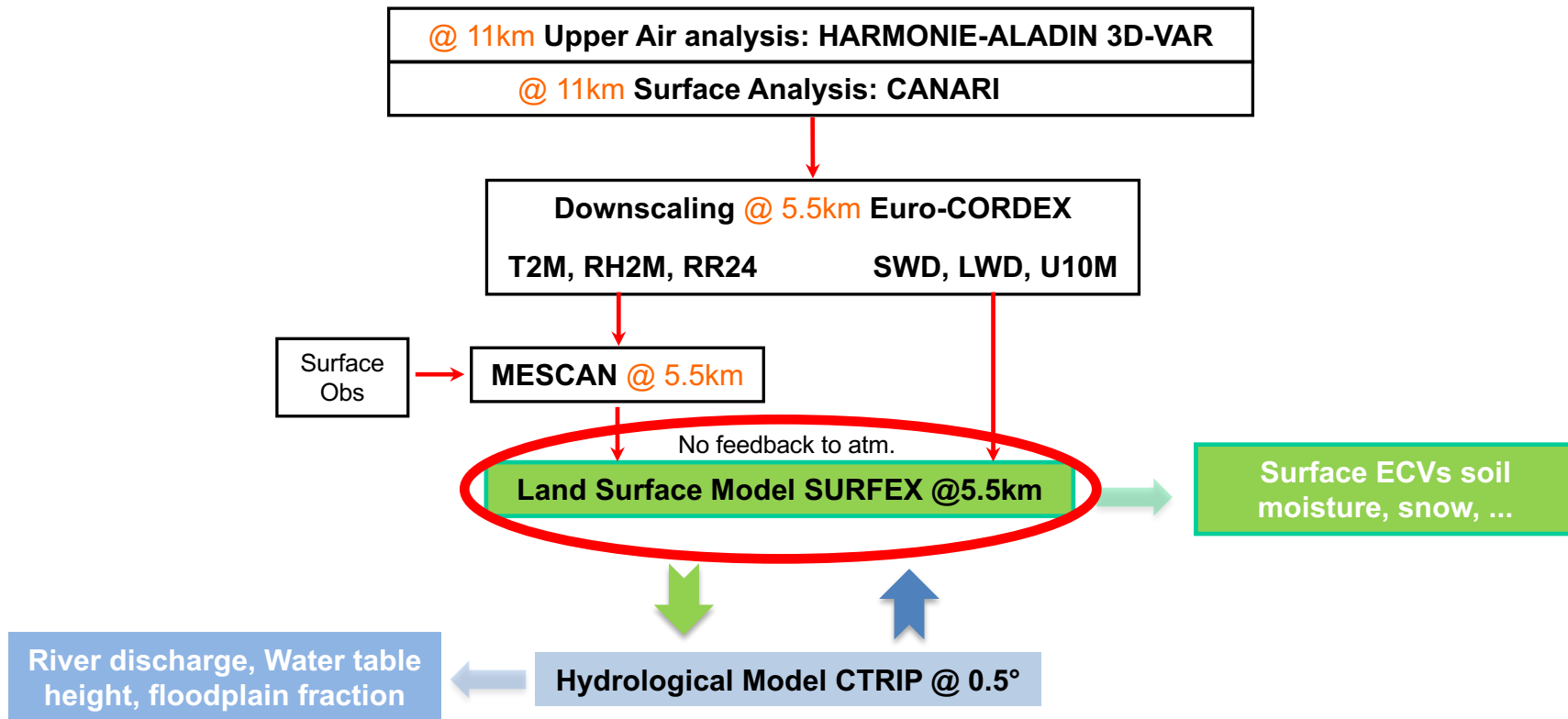
UERRA Schematic





Climate
Change

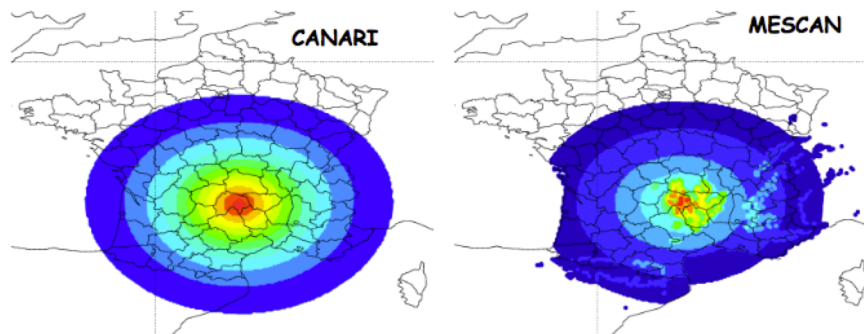
UERRA Schematic





Surface Analysis

- CANARI (integrated in ARPEGE/IFS) is used in NWP for surface analysis, and is based on the Optimal Interpolation technique
- CANARI was improved for reanalysis purposes
 - By using MESAN (Hirlam) structure functions in the analysis of T2M and RH2M
 - By developing a precipitation analysis accounting for local observations
- MESCOAN was used for the production of T2M, RH2M and RR24 in UERRA at 5.5km
 - For the 1961-2015 period
 - For the 2006-2010 period to build an ensemble (density of observation network, guess, etc.)





- **SURFEX** is a land surface model aiming to compute/exchange fluxes at the interface surface-atmosphere

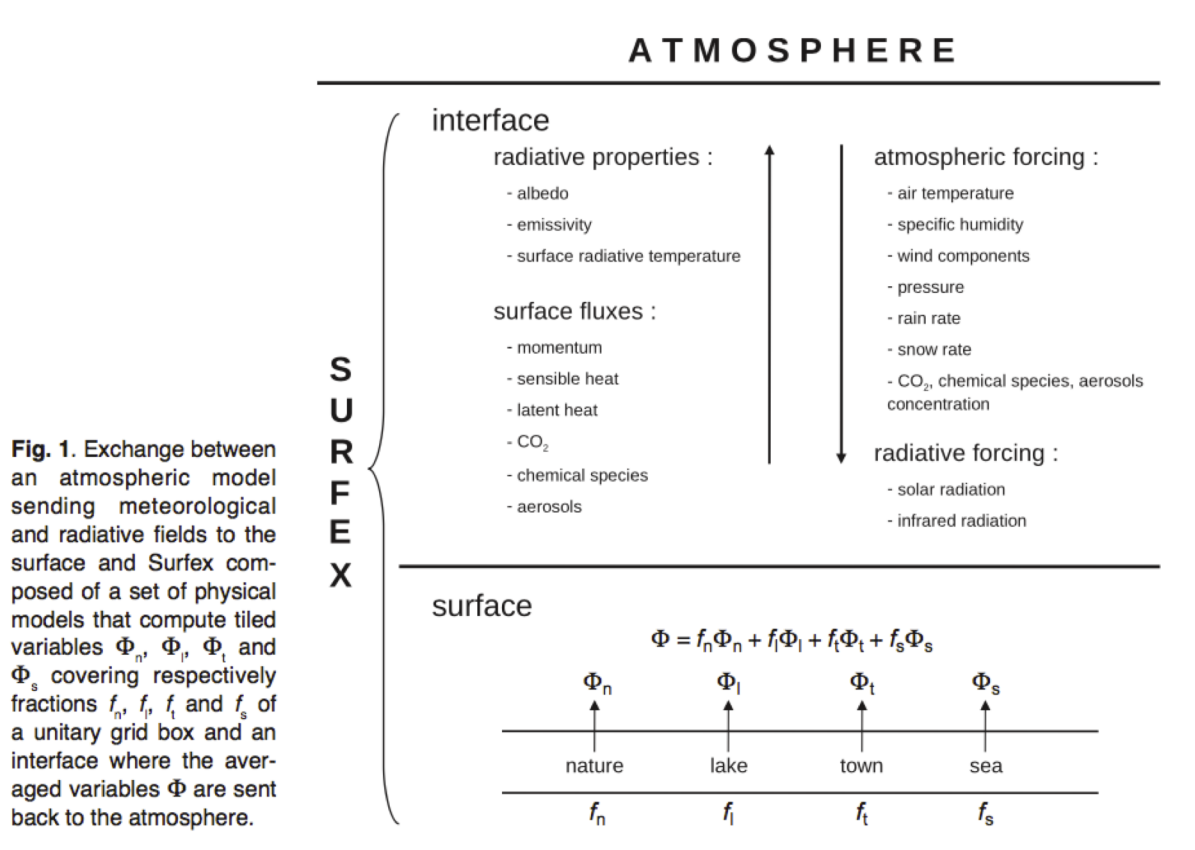


Fig. 1. Exchange between an atmospheric model sending meteorological and radiative fields to the surface and Surfex composed of a set of physical models that compute tiled variables Φ_n , Φ_l , Φ_t and Φ_s covering respectively fractions f_n , f_l , f_t and f_s of a unitary grid box and an interface where the averaged variables Φ are sent back to the atmosphere.



SURFEX Land Surface Model

ATMOSPHERE

interface

radiative properties :

- albedo
- emissivity
- surface radiative temperature

surface fluxes :

- momentum
- sensible heat
- latent heat
- CO₂
- chemical species
- aerosols

atmospheric forcing :

- air temperature
- specific humidity
- wind components
- pressure
- rain rate
- snow rate
- CO₂, chemical species, aerosols concentration

radiative forcing :

- solar radiation
- infrared radiation

SURFEX

surface

$$\Phi = f_n \Phi_n + f_l \Phi_l + f_t \Phi_t + f_s \Phi_s$$

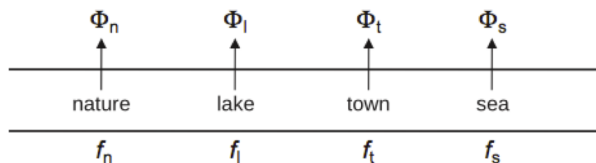


Fig. 1. Exchange between an atmospheric model sending meteorological and radiative fields to the surface and Surfex composed of a set of physical models that compute tiled variables Φ_n , Φ_l , Φ_t and Φ_s covering respectively fractions f_n , f_l , f_t and f_s of a unitary grid box and an interface where the averaged variables Φ are sent back to the atmosphere.

MESCAN @5.5km
6-hourly and daily forcing

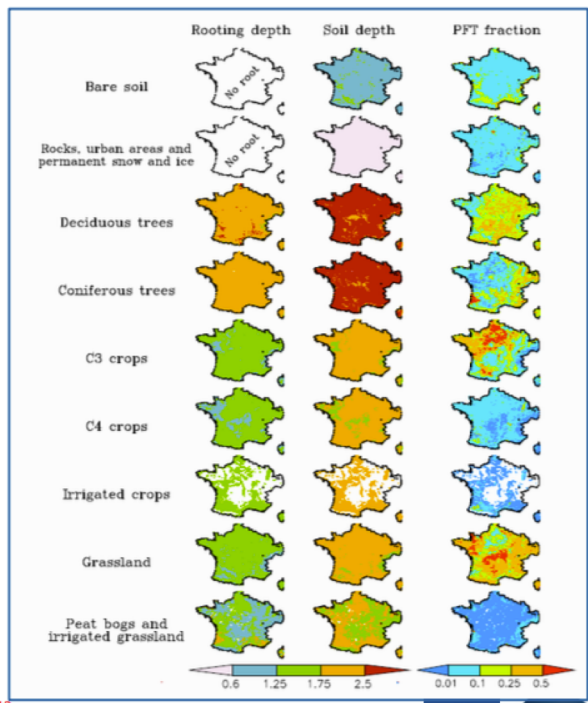
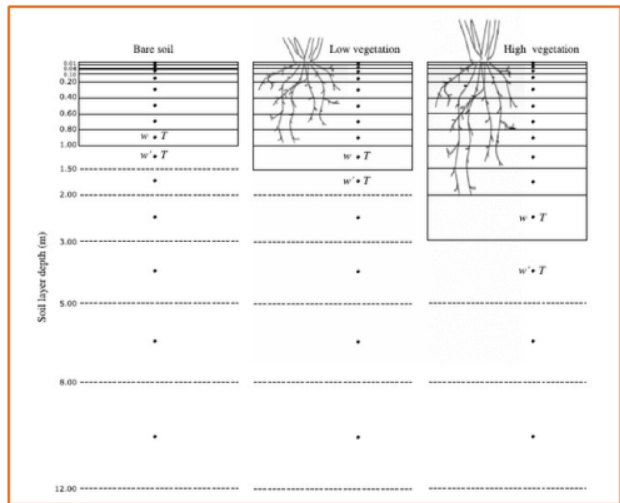
DOWNSCALING @5.5km
6-hourly forcing



SURFEX Land Surface Model

- Main SURFEX characteristics
 - multi-layer model for soil heat and water transfer
 - multi-layer snow model
 - 12 Plant Functional Types
 - Simplified photosynthesis

- Diffusion scheme (ISBA-DF)
 - Based on Fourier law for T and Richard's equation for w

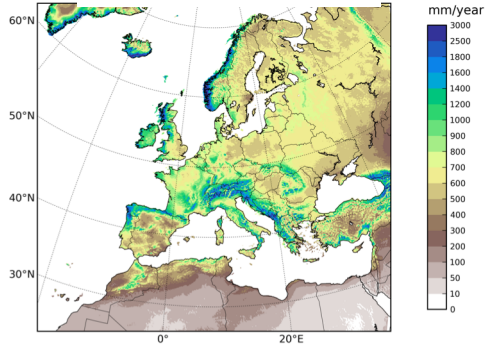




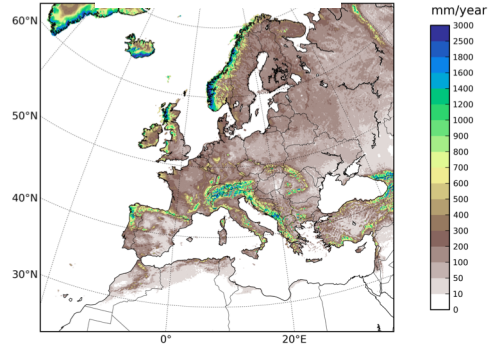
SURFEX Water Budget 1961-2015

Clima
Chan.

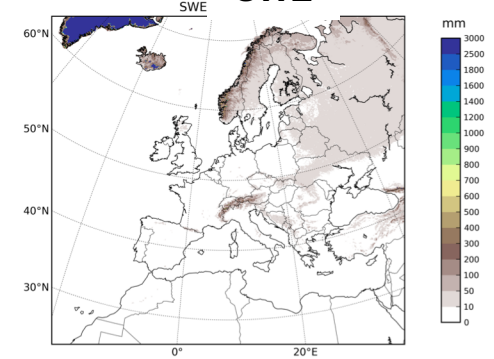
PRECIPITATION



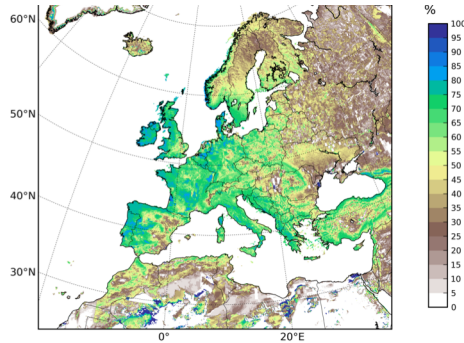
P - E



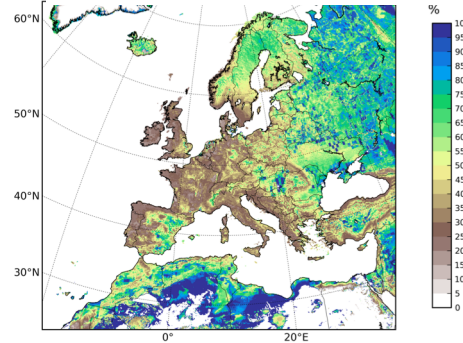
SWE



INFILTRATION / (P - E)



RUNOFF / (P - E)





- <http://apps.ecmwf.int/dataset/uerra/>

Type of level

- Soil levels
- **Surface**

Type

- Analysis
- **Forecast**

Models

- HARMONIE/V1
- HARMONIE/V2
- UM
- UM/En
- COSMO/En
- MESAN/V1
- MESCAN-SURFEX
- **MESCAN-SURFEX/En**

- MESCAN-SURFEX/En **Analysis Surface**:
 - MESCAN analysis of T2M, RH2M, RR24
- MESCAN-SURFEX/En **Forecast Surface**:
 - SURFEX variables
- MESCAN-SURFEX/En **Analysis Soil levels**:
 - SURFEX volumetric wilting point and field capacity
- MESCAN-SURFEX/En **Forecast Soil levels**:
 - SURFEX temperature and soil moisture profiles



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SURFEX surface variables

ECMWF Contact Patrick Le-Moigne

UERRA, MESCAN-SURFEX

Select a month

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Select time

00:00:00 06:00:00 12:00:00 18:00:00

Select All or Clear

Select step

1 2 3 4 5 6

ECMWF Contact Patrick Le-Moigne

Select time

00:00:00 06:00:00 12:00:00 18:00:00

Select All or Clear

Select step

1 2 3 4 5 6

Select All or Clear

Select parameter

<input type="checkbox"/> 2 metre relative humidity	<input type="checkbox"/> 2 metre temperature
<input type="checkbox"/> 10 metre wind direction	<input type="checkbox"/> 10 metre wind speed
<input type="checkbox"/> Albedo	<input type="checkbox"/> Percolation
<input type="checkbox"/> Skin temperature	<input type="checkbox"/> Snow Fall water equivalent
<input type="checkbox"/> Snow density	<input type="checkbox"/> Snow depth
<input type="checkbox"/> Snow depth water equivalent	<input type="checkbox"/> Soil heat flux
<input type="checkbox"/> Surface latent heat flux	<input type="checkbox"/> Surface net solar radiation
<input type="checkbox"/> Surface net thermal radiation	<input type="checkbox"/> Surface pressure
<input type="checkbox"/> Surface roughness	<input type="checkbox"/> Surface runoff
<input type="checkbox"/> Surface sensible heat flux	<input type="checkbox"/> Surface solar radiation downwards
<input type="checkbox"/> Surface thermal radiation downwards	<input type="checkbox"/> Time-integrated surface direct short wave radiation flux
<input type="checkbox"/> Total Precipitation	



Climate
Change

Thanks for your attention!

<http://apps.ecmwf.int/datasets/uerra/>

UERRA data soon available on the CDS