

## Full ERA5-Land documentation:

<https://confluence.ecmwf.int/display/CKB/ERA5-Land%3A+data+documentation>

Some important aspects:

### 1. Accumulations:

Please, note that the convention for accumulations used in ERA5-Land differs with that for ERA5. The accumulations in the short forecasts of ERA5-Land (with hourly steps from 01 to 24) are treated the same as those in ERA-Interim or ERA-Interim/Land, i.e., they are accumulated from the beginning of the forecast to the end of the forecast step. For example, runoff at  $day=D$ ,  $step=12$  will provide runoff accumulated from  $day=D$ ,  $time=0$  to  $day=D$ ,  $time=12$ . The maximum accumulation is over 24 hours, i.e., from  $day=D$ ,  $time=0$  to  $day=D+1$ ,  $time=0$  ( $step=24$ ).

### 2. Actual and potential evapotranspiration

Actual evapotranspiration in the ERA5-Land datasets is called "Total Evaporation" (param ID 182) and is the sum of the following four evaporation components:

1. Evaporation from bare soil
2. Evaporation from open water surfaces excluding oceans
3. Evaporation from the top of canopy
4. Evaporation from vegetation transpiration

For the ERA5-Land datasets, actual evapotranspiration and its four components can be downloaded from the C3S Climate Data Store (CDS) under the category heading "Evaporation and Runoff".

For details about the computation of actual evapotranspiration, please see Chapter 8 of Part IV : Physical processes, of the IFS documentation. [...] The potential evapotranspiration in the ERA5-Land CDS dataset is given by the parameter potential evaporation (pev). [...] The definitions of potential and reference evapotranspiration may vary according to the scientific application and can have the same definition in some cases. Users should therefore ensure that the definition of this parameter is suitable for their application. [...]

ERA5Land: the definition of PEV in ERA5Land is computed as an open water evaporation (Pan evaporation) and assuming that the atmosphere is not affected by this artificial surface condition.

Please note that based on ERA5-Land atmospheric forcing, other independent (offline) methods such as "Priesley-Taylor<sup>1</sup> (1972) , Schmidt<sup>2</sup> (1915) or de Bruin<sup>3</sup> (2000)" can also be used to estimate Potential evapotranspiration. [...]

[...]

Potential evaporation in the current ECMWF Integrated Forecasting System is based on surface energy balance calculations with the vegetation parameters set to 'crops/mixed farming' and assuming 'no stress from soil moisture'. In other words, evaporation is computed for agricultural land as if it is well watered and assuming that the atmosphere is not affected by this artificial surface condition. The latter may not always be realistic.

**Although potential evaporation is meant to provide an estimate of irrigation requirements, the method can give unrealistic results in arid conditions due to too strong evaporation forced by dry air.**

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## **Additional Processing and Information**

### total precipitation:

- tp or tp\_mm
- accumulated parameter
- provided at time = 00:00 and therefore the accumulation of the previous 24hrs
- converted from m to **mm**
- values < 0.001mm were set zero

### 2m temperature:

- t2m or t2m\_degC
- instantaneous parameter
- provided as mean value of times: 00:00, 06:00, 12:00, 18:00 at the given date
- converted from °K to **°C**

### snow depth:

- sde or sde\_m
- **[m]**
- instantaneous parameter
- provided as mean value of times: 00:00, 06:00, 12:00, 18:00 at the given date

### potential evaporation:

- pev or pev\_mm
- accumulated parameter
- provided at time = 00:00 and therefore the accumulation of the previous 24hrs
- converted from m to **mm**
- negative values were set zero

### total evaporation:

- e or e\_m
- accumulated parameter
- provided at time = 00:00 and therefore the accumulation of the previous 24hrs
- **[m of water equivalent]**
- negative values indicate evaporation and positive values indicate condensation

### snowfall:

- sf or sf\_m
- accumulated parameter
- provided at time = 00:00 and therefore the accumulation of the previous 24hrs
- **[m of water equivalent]**
- values < 1E-6 m were set zero

### snowmelt:

- smlt or smlt\_m
- accumulated parameter
- provided at time = 00:00 and therefore the accumulation of the previous 24hrs
- **[m of water equivalent]**
- values < 1E-6 m were set zero

### surface net solar radiation:

- ssr or ssr\_jm2
- accumulated parameter
- provided at time = 00:00 and therefore the accumulation of the previous 24hrs
- **[J m<sup>-2</sup>]**
- To convert to watts per square metre (W m<sup>-2</sup>), the accumulated values should be divided by the accumulation period expressed in seconds (which is 24hours in this case)
- The ECMWF convention for vertical fluxes is positive downwards.

10 metre U wind component:

- 10m\_u\_component\_of\_wind or u10\_ms
- [**m s<sup>-1</sup>**]
- instantaneous parameter
- provided as mean value of times: 00:00, 06:00, 12:00, 18:00 at the given date

10 metre V wind component:

- 10m\_v\_component\_of\_wind or v10\_ms
- [**m s<sup>-1</sup>**]
- instantaneous parameter
- provided as mean value of times: 00:00, 06:00, 12:00, 18:00 at the given date