

# List of output variables for atmospheric models

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Version 4.0 as of 20 February 2007

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Following is the (TIGGE-inspired) list of variables originally set-up for D-PHASE atmospheric models. We will use this list as starting point of our discussion for variables to be stored for model reruns within MesoVICT. Selected variables in the list below are necessary to compare with VERA variables.

## Model types:

Since different types of models need to provide different variables, we divide the models into

- high-resolution deterministic models (“high-res”; mesh-size O(1-3km));
- deterministic models driving the high-resolution deterministic models (“driving models” or “dri”);
- and ensemble prediction systems (“ensembles” or “ens”).

## Single level fields

For MesoVICT only single level (surface) fields are regarded from the models. For upper level fields on model levels or pressure levels contact WDCC in Hamburg for the old model runs and the data provider for the new model runs on a bilateral basis.

## Domains:

Model output should be provided for the **VERA domain (41 to 55 N, -2 to 20 E)**, that is, models with a bigger computational domain are requested to restrict their output to the VERA domain, whereas models with a smaller computational domain should provide output for the full domain. If this is not possible smaller domains will be accepted as long as the domain will cover the whole Alpine region and it is in the centre of the model domain.

## Data format:

GRIB1

## Naming convention for output files:

*<INIDATE(10)>\_<DOMAIN(4)>\_<MODEL(8)>\_<ENSNR(3)>\_<TYPE(4)>\_D.grb*

where

- INIDATE: YYYYMMDDHH (in UTC), initial time of the forecast
- DOMAIN: "VERA" (only this allowed)
- MODEL: e.g. COSMOCH7, CLEPS, ... (maximal 8 characters, less are ok)
- ENSNR: EXX, i.e. E01, E02, ..., E16, ... for 16 or more ensemble members. The ensemble mean is named "E00". <ENSNR> is left out for deterministic models.
- TYPE:
  - "FIX" : constant fields (marked by "once" in the table below),
  - "TPT2": tot\_prec, t\_2m,
  - "SURF": all single-level fields,

FIX will be provided only once, while the other TYPEs have to be provided for each forecast.

D stands for data.

#### **Abbreviations:**

high-res: high-resolution deterministic models

dri: driving models

ens: ensembles

Acc: Accumulation

inst: instantaneous output

det\_lo: determined over period from last output time to current output time

acc\_st: accumulated over period from start of forecast to current output time

avg: averaged over the forecast period

### Single level fields

Variable	output time steps			Acc	Variable number	Table number	Variable for MesoVICT necessary
	high-res	dri	ens				
Pressure at mean sea level (Pa)	1h	1h	1h	inst	002	002	x
Pressure at the surface (Pa)	1h	1h	1h	inst	001	002	x
2m temperature (K)	1h	1h	1h	inst	011	002	x
2m min temperature (K)	1h	1h	1h	det_lo	016	002	
2m max temperature (K)	1h	1h	1h	det_lo	015	002	
2m specific humidity (kg/kg)	1h	1h	1h	inst	051	002	x
10m U-velocity (m/s)	1h	1h	1h	inst	033	002	x
10m V-velocity (m/s)	1h	1h	1h	inst	034	002	x
10m wind gust (m/s)	1h	1h	1h	det_lo	187	201	x
Total precipitation (all types) (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	061	002	x
Precipitation: grid-scale only, rain (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	102	201	
Precipitation: grid-scale only, snow (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	079	002	
Precipitation: grid-scale only, graupel (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	132	201	
Precipitation: grid-scale only, hail (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	218	201	
Precipitation: convective, rain (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	113	201	
Precipitation: convective, snow (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	078	002	
Precipitation: convective, graupel (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	217	201	
Precipitation: convective, hail (kg/m <sup>2</sup> )	1h	1h	1h	acc_st	219	201	
Total precipitation rate (all types) (kg/s/m <sup>2</sup> )	1h	1h	1h	inst	059	002	
Precipitation rate: grid-scale only, rain (kg/s/m <sup>2</sup> )	1h	1h	1h	inst	100	201	
Precipitation rate: grid-scale only, snow (kg/s/m <sup>2</sup> )	1h	1h	1h	inst	101	201	
Precipitation rate: grid-scale only,	1h	1h	1h	inst	131	201	

Variable	output time steps			Acc	Variable number	Table number	Variable for MesoVICT necessary
	high-res	dri	ens				
graupel (kg/s/m <sup>2</sup> )							
Precipitation rate: grid-scale only, hail (kg/s/m <sup>2</sup> )	1h	1h	1h	inst	221	201	
Total column water (non-precipitable water) (kg/m <sup>2</sup> )	1h	1h	1h	inst	041	201	
Total column water vapour (or precipitable water) (kg/m <sup>2</sup> )	1h	1h	1h	inst	054	002	
Total column cloud water (or cloud water) (kg/m <sup>2</sup> )	1h	1h	1h	inst	076	002	
Total column cloud ice (or cloud ice) (kg/m <sup>2</sup> )	1h	1h	1h	inst	058	002	
Total cloud cover (%)	1h	1h	1h	inst	071	002	
Cloud cover, low (%) (800 hPa – surface)	1h	1h	1h	inst	073	002	
Cloud cover, middle (%) (400 hPa – 800 hPa)	1h	1h	1h	inst	074	002	
Cloud cover, high (%) (0 hPa – 400 hPa)	1h	1h	1h	inst	075	002	
Cloud bottom height (m)	1h	1h	1h	inst	086	201	
Cloud top height (m)	1h	1h	1h	inst	087	201	
Convective cloud top height (m)	1h	1h	1h	inst	069	201	
Convective cloud bottom height (m)	1h	1h	1h	inst	068	201	
Surface latent heat flux (W/m <sup>2</sup> )	1h	1h		avg	121	002	
Surface sensible heat flux (W/m <sup>2</sup> )	1h	1h		avg	122	002	
Surface solar net radiation (W/m <sup>2</sup> )	1h	1h		avg	111	002	
Surface longwave net radiation (W/m <sup>2</sup> )	1h	1h		avg	112	002	
TOA shortwave net radiation (W/m <sup>2</sup> )	1h	1h		avg	113	002	
TOA longwave net radiation (W/m <sup>2</sup> )	1h	1h		avg	114	002	
Sunshine duration (s)	1h	1h		acc_st	020	201	
Skin temperature (K)	1h	1h		inst	117	201	
Snow depth (m)	1h	1h		inst	066	002	

Variable	output time steps			Acc	Variable number	Table number	Variable for MesoVICT necessary
	high-res	dri	ens				
Soil moisture (all layers) (kg/m <sup>2</sup> )	1h	1h		inst	086	002	
Soil temperature (all layers) (K)	1h	1h		inst	085	002	
Boundary layer top height (m)	1h	1h		inst	088	201	
Convective available potential energy (J/kg)	1h	1h		inst	241	201	
Convective Inhibition (J/kg)	1h	1h		inst	089	201	
Height of 0C isothermal amsl (m)	1h	1h		inst	084	201	
Snow fall limit (m)	1h	1h		inst	085	201	
Leaf area index	once per run	once per run	once per run		061	202	
Root depth (m)	once per run	once per run	once per run		062	202	
Longitude, degrees E (°)	once	once	once		115	202	x
Latitude, degrees N (°)	once	once	once		114	202	x
Geometrical height of earth surface amsl (m)	once	once	once		008	002	x
Geopotential of earth surface (m <sup>2</sup> /s <sup>2</sup> )	once	once	once		006	002	x
Land-sea mask	once	once	once		081	002	x
Vegetation (plant cover) (%)	once	once	once		087	002	
Soil type for all layers, if available	once	once	once		057	202	
2m temperature ens mean (K)			1h	inst	011	002	x
2m specific humidity ens mean (kg/kg)			1h	inst	051	002	x
Total precipitation ens mean (kg/m <sup>2</sup> )			1h	acc_st	061	002	x
10m wind gust ens mean (m/s)			1h	det_lo	187	201	x