



ICON database Reference manual

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Chapter 1

Available output fields in GRIB2-format

In GRIB2, a variable is uniquely defined by the following set of metadata:

- *Discipline* (see GRIB2 code table 4.2)
- *ParameterCategory* (see GRIB2 code table 4.2)
- *ParameterNumber* (see GRIB2 code table 4.2)
- *typeOfFirstFixedSurface* and *typeOfSecondFixedSurface* (see GRIB2 code table 4.5)
- *stepType* (instant, accum, avg, max, min, diff, rms, sd, cov, ...)

In the following, *typeOfFirstFixedSurface* and *typeOfSecondFixedSurface* will be abbreviated by *Lev-Typ 1/2*.

1.1 Output fields which are no longer available

With the launch of ICON, the following output fields will no longer be available:

- **OMEGA** [Pa/s]: Vertical velocity in pressure coordinates $\omega = \frac{dp}{dt}$
- **BAS_CON** [-]: Level index of convective cloud base
- **TOP_CON** [-]: Level index of convective cloud top
- **T_S** [K]: Temperature at soil-atmosphere-, or soil-snow-interface. Note that $T_S = T_{SO}(0)$, thus T_S is redundant.
- **W_G1** [mm H₂O]: Soil water content in upper layer (0 to 10 cm)
- **W_G2** [mm H₂O]: Soil water content in middle layer (10 to 100 cm)

1.2 New output fields

New output fields that will become available with the launch of ICON are:

- **W** [m/s]: vertical velocity in height coordinates $w = \frac{dz}{dt}$
- **DEN** [kg/m³]: density of moist air

1.3 Available output fields listed in tabular form

Table 1.1: Hybrid multi-layer forecast ($VV > 0$) and initialized analysis ($VV = 0$) products

ShortName	Description	Discipline	Category	Number	Lev-Type	stepType	Unit
U	Zonal wind	0	2	2	105	inst	m s^{-1}
V	Meridional wind	0	2	3	105	inst	m s^{-1}
W	Vertical wind	0	2	9	105	inst	m s^{-1}
T	Temperature	0	0	0	105	inst	K
DEN	Density of moist air	0	3	10	105	inst	kg m^{-3}
QV	Specific humidity	0	1	0	105	inst	kg kg^{-1}
QC	Cloud mixing ratio ¹	0	1	22	105	inst	kg kg^{-1}
QI	Cloud ice mixing ratio ¹	0	1	82	105	inst	kg kg^{-1}
QR	Rain mixing ratio ¹	0	1	24	105	inst	kg kg^{-1}
QS	Snow mixing ratio ¹	0	1	25	105	inst	kg kg^{-1}
CLC	Cloud cover	0	6	22	105	inst	%
O3	Ozone mixing ratio ²	0	14	1	105	inst	kg kg^{-1}

Table 1.2: Single-layer forecast ($VV > 0$) and initialized analysis ($VV = 0$) products

ShortName	Description	Discipline	Category	Number	Lev-Type	stepType	Unit
PS	Surface pressure (not reduced)	0	3	1	1	inst	Pa
T_SNOW	Temperature of the snow surface	0	0	18	1	inst	K
T_G	Ground temperature (temperature at sfc-atm interface)	0	0	0	1	inst	K
QV_S	Surface specific humidity	0	1	0	1	inst	kg kg^{-1}
W_SNOW	Snow depth water equivalent	0	1	60	1	inst	kg m^{-2}
W_I	Plant canopy surface water	2	0	13	1	inst	kg m^{-2}

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¹for the time being, erroneously encoded as mixing ratios instead of specific quantities

²not clear yet, whether ozone will be provided as output field

Table 1.2: *continued*

TCM	Turbulent transfer coefficient for momentum (surface)	0	2	29	1	inst	--
TCH	Turbulent transfer coefficient for heat and moisture (surface)	0	0	19	1	inst	--
ASOB_S	Net short-wave radiation flux at surface (average since model start)	0	4	9	1	avg	W m^{-2}
ATHB_S	Net long-wave radiation flux at surface (average since model start)	0	5	5	1	avg	W m^{-2}
ASOB_T	Net short-wave radiation flux at TOA (average since model start)	0	4	9	8	avg	W m^{-2}
ATHB_T	Net long-wave radiation flux at TOA (average since model start)	0	5	5	8	avg	W m^{-2}
ALB_RAD	Surface albedo for visible range, diffuse	0	19	1	1	inst	%
RAIN_GSP	Large scale rain (accumulated since model start)	0	1	77	1	accu	kg m^{-2}
SNOW_GSP	Large snowfall water equivalent (accumulated since model start)	0	1	56	1	accu	kg m^{-2}
RAIN_CON	Convective rain (accumulated since model start)	0	1	76	1	accu	kg m^{-2}
SNOW_CON	Convective snowfall water equivalent (accumulated since model start)	0	1	55	1	accu	kg m^{-2}
TOT_PREC	Total precipitation (accumulated since model start)	0	1	52	1	accu	kg m^{-2}
RUNOFF_S	Surface water runoff (accumulated since model start) ³	2	0	5	1	accu	kg m^{-2}
RUNOFF_G	Soil water runoff (accumulated since model start) ³	2	0	5	1	accu	kg m^{-2}
U_10M	Zonal wind at 10m above ground	0	2	2	103	inst	m s^{-1}
V_10M	Meridional wind at 10m above ground	0	2	3	103	inst	m s^{-1}
T_2M	Temperature at 2m above ground	0	0	0	103	inst	K
TD_2M	Dew point temperature at 2m above ground	0	0	6	103	inst	K
Z0	Surface roughness (above land and water)	2	0	1	1	inst	m
CLCT	Total cloud cover	0	6	1	1	inst	%

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Table 1.2: *continued*

CLCH	High level clouds ³	0	6	1	100	inst	%
CLCM	Mid level clouds ³	0	6	1	100	inst	%
CLCL	Low level clouds ³	0	6	1	100	inst	%
TQV	Total column integrated water vapour	0	1	64	1	inst	kg m ⁻²
TQC	Total column integrated cloud water	0	1	69	1	inst	kg m ⁻²
TQI	Total column integrated cloud ice	0	1	70	1	inst	kg m ⁻²
TQR	Total column integrated rain ³	0	1	45	1	inst	kg m ⁻²
TQS	Total column integrated snow ³	0	1	46	1	inst	kg m ⁻²
HBAS_CON	Height of convective cloud base above msl	0	6	26	2	inst	m
HTOP_CON	Height of convective cloud top above msl	0	6	27	3	inst	m
HZEROCL	Height of 0 degree Celsius isotherm above msl	0	3	6	4	inst	m
ASHFLS	Sensible heat net flux at surface (average since model start)	0	0	11	1	avg	W m ⁻²
ALHFLS	Latent heat net flux at surface (average since model start)	0	0	10	1	avg	W m ⁻²
FR_ICE	Sea ice cover (possible range: [0, 1])	10	2	0	1	inst	–
T_ICE	Sea ice temperature (at ice-atm interface)	10	2	8	1	inst	K
H_ICE	Sea ice thickness (Max: 3 m)	10	2	1	1	inst	m
FRESHSNW	Fresh snow factor (weighting function for albedo indicating freshness of snow)	0	1	203	1	inst	–
RHO_SNOW	Snow density	0	1	61	1	inst	kg m ⁻³
H_SNOW	Snow depth	0	1	11	1	inst	m

³Output fields not yet available, but planned.

Table 1.4: *Soil model: vertical distribution of levels and layers*

level nr.	depth [cm]	layer nr.	upper/lower bounds [cm]
0	0.0		
1	0.5	1	0.0 — 1.0
2	2.0	2	1.0 — 3.0
3	6.0	3	3.0 — 9.0
4	18.0	4	9.0 — 27.0
5	54.0	5	27.0 — 81.0
6	162.0	6	81.0 — 243.0
7	486.0	7	243.0 — 729.0
8	1458.0	8	729.0 — 2187.0

Table 1.3: Multi-layer forecast ($VV > 0$) and initialized analysis ($VV = 0$) products of the soil model

ShortName	Description	Discipline	Category	Number	Lev-Typ	stepType	Unit
T_SO	Soil temperature	2	3	18	106	inst	K
W_SO	Soil moisture integrated over individual soil layers (ice + liquid)	2	3	20	106	inst	kg m ⁻²
W_SO_ICE	Soil ice content integrated over individual soil layers	2	3	22	106	inst	kg m ⁻²

Soil temperature is defined at the soil depths given in Table 1.4 (column 2). Levels 1 to 8 define the full levels of the soil model. A zero gradient condition is assumed between level 0 and 1, meaning that temperatures at the surface-atmosphere interface are set equal to the temperature at the first full level depth. (0.5 cm). Temperatures are prognosed for level 1 to 7. At the lowermost level (1458 cm) the temperature is fixed to the climatological average 2 m-temperature.

Soil moisture W_SO is prognosed for layer 1 to 6. In the two lowermost layers W_SO is time constant.

Bibliography