Radiation Variables in GRIB2 and ICON

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Radiative fluxes are stored for solar (diffuse, direct, total) and thermal bands (also called short-wave and long-wave, respectively). They are available as upward, downward and net and at the levels top of atmosphere (TOA) and the surface. Accumulation (preceding "ACC"), average (preceding "A") or instantaneous (ending "_RAD", remove other "_") values can be archived. These statistics are valid from the beginning of the forecast to the output time. The short-names in the DWD GRIB2 description convention are then produced by the following components.

Statistic	**Band**	**Direction**	**Text**	**Level**	**Statistic**
A (average)	TH (thermal/lw)	U (up)	_ (average)	T	nothing (average)
ACC (accumulated)	SO (solar/sw)	D (down)	_ (accumulated)	S	nothing (accumulated)
nothing (instantaneous)	SODIF (solar diffuse)	B (net or budget)	nothing (instantaneous)		_RAD (instantaneous)
	SODIR (solar direct)				

An example is ASOB_T, that is the net solar flux at TOA. Not all fluxes exist. For example there is no downward thermal flux at TOA. The following table lists the existing fluxes with the associated DWD shortnames and the GRIB2 descriptors.

Description	**DWD ShortName**	**ICON ShortName**	**ECMWF ShortName**	**Discipline**	**Category**	**Number**	**levType**
Top net solar radiation	ASOB_T	asob_t	tsr	0	4	9	8
Top up solar radiation	ASOU_T		— (red.)	0	4	8	8
Top down solar radiation	ASOD_T		tisr	0	4	7	8
Surface net solar radiation	ASOB_S	asob_s	ssr	0	4	9	1
Surface up solar radiation	ASOU_S		— (red.)	0	4	8	1
Surface down solar radiation	ASOD_S		ssrd	0	4	7	1
Surface down solar diff. rad.	ASODIFD_S		— (red.)	0	4	199	1
Surface up solar diff. rad.	ASODIFU_S		— (red.)	0	4	8	1
Surface down solar direct rad.	ASODIRD_S		dsrp	0	4	198	1
Top net thermal radiation	ATHB_T	athb_t	ttr	0	5	5	8
Surface net thermal radiation	ATHB_S	athb_s	str	0	5	5	1
Surface up thermal radiation	ATHU_S		— (red.)	0	5	4	1
Surface down thermal radiation	ATHD_S		strd	0	5	3	1

The above names are for the example “average”. See the first table how the other statistics “accumulated” and “instantaneous” are constructed. Note that ATHD_T = 0 and therefore ATHU_T = ATHB_T. Also, ASODIRU_S = 0, therefore ASODIRD_S = ASODIRB_S and ASODIFU_S = ASOU_S (both currently have the same GRIB2 triple).

One set of variables that is sufficient to derive all others is the set defined by the ECMWF variables. The others are marked as redundant (“red.”).