Migration to GRIB2 -> 50r2

UEF2026

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Questions at any time via Slido

www.slido.com

#2414240

Context

-> GRIB1 has been deprecated by WMO more than 2 decades ago.

-> ECMWF is required to publish in GRIB2 a set of core parameters on the WIS2 by March 2027.

-> future horizontal resolution increase of IFS will likely hit the GRIB1 limitations.

-> In 2011, IFS increased the number of model levels above 125 levels (137 levels) -> only model levels were migrated.

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Terms of reference

-> Scope

  -> Migrate all parameters

  -> Only new data produced, no conversion of existing data

  -> Migrate our entire software stack: I/O routines in models, interpolation, plotting, indexing, archiving, dissemination

-> Requirements

  -> Minimize disruptions to our operations and to our users

  -> Maintain consistency with existing data

  -> Provide tools to ease the migration

  -> Take advantage of the rich metadata

  -> Support Member states

  -> Fully WMO compliant, avoid local encoding

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Migration preparation: New templates, new parameters

-> Templates (~80 new templates added to GRIB2)

- -> Wave spectra (frequency/direction) and wave period templates
- -> Anomalies, EFI, SOT templates
- -> Tile templates for land surface modelling
- -> Probability templates with focal statistics
- -> Quantiles
- -> Large ensembles (>255 members)

-> Parameters

- -> Heatwaves/thermal stress related parameters
- -> Soil/snow/ice model levels/layers
- -> Hydrological parameters
- -> Ocean, ice and waves
- -> Destination Earth and ERA6 parameters

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-> richer, more explicit metadata and parameter semantics

-> extensible template framework for new products and encodings

-> stronger WMO alignment for interoperable data exchange

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probability of accumulated total precipitation at surface of at least 25mm

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GRIB1 (ECMWF - local)

table2Version=131 (technical - no meaning)
indicatorOfParameter=98 (probability of accumulated total precipitation at surface of at least 25mm)
timeRangeIndicator=4 (accumulation)
typeOfLevel=1 (surface)

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In ecCodes, these 2 GRIB representations share:

- the same `paramId`: 131098
- the same `shortName`: tpg25

Parameters changes across the migration

-> All parameters containing a time range will be deprecated:

  -> In the last XX hours

  -> Since previous post-processing

  -> The time range will be handled by the new keyword `timespan`

-> Parameters without canonical WMO units will be deprecated

  -> Replaced by variants with WMO units

-> Some parameters will be indexed differently in MARS:

  -> Multi levels/layers:

    -> A single Soil temperature parameter on soil levels 1 to 4, rather than four parameters on level type `surface`

  -> Parameters at a specific height in metres: 50m, 100m, 200m, etc.

    -> Single generic parameter on the new levtype height level "hl" rather than many different parameters on levtype sfc.

    -> BUT parameters <=10m will not change, e.g. 2t and 10u/v

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New model for time processing

instantaneous parameter

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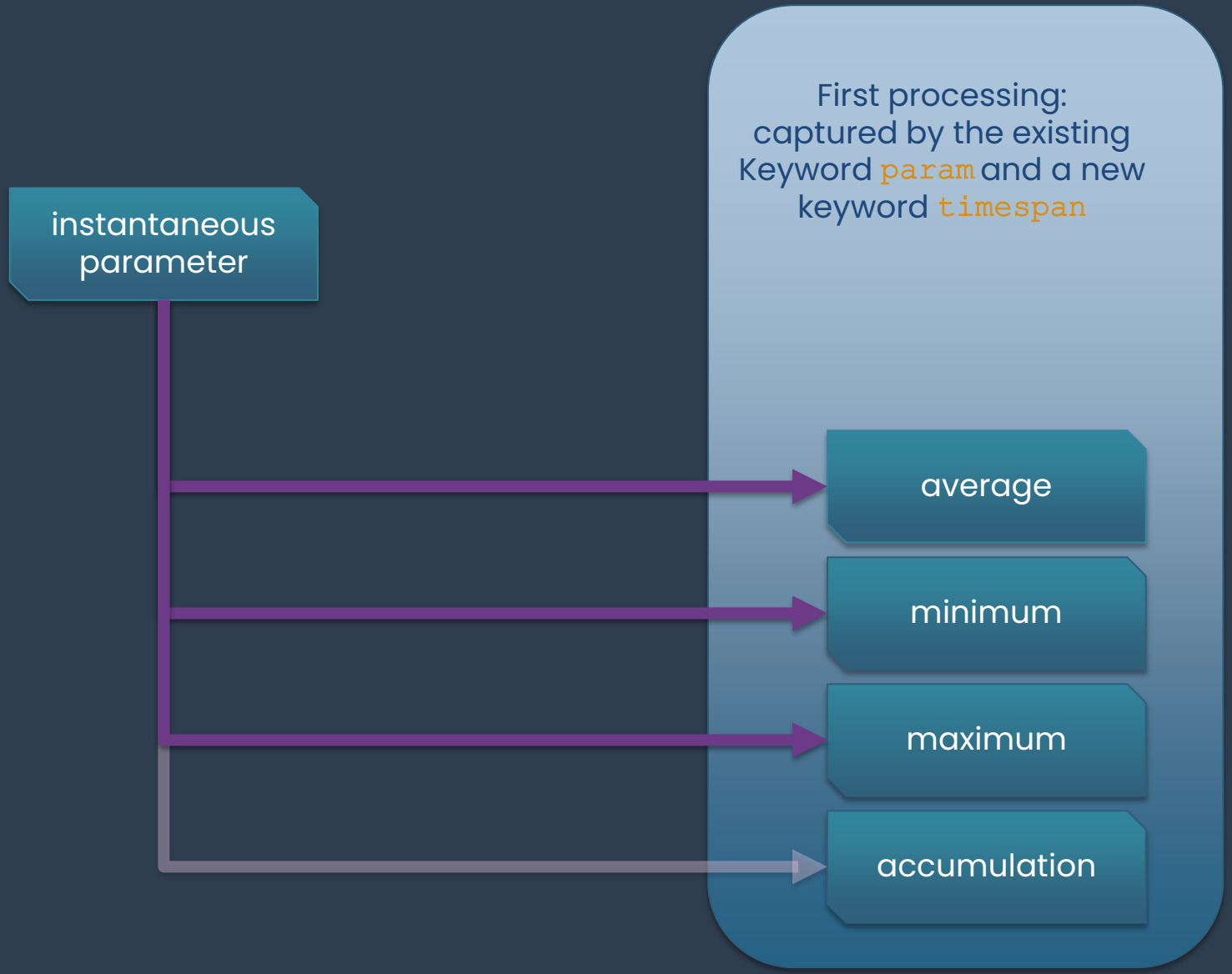

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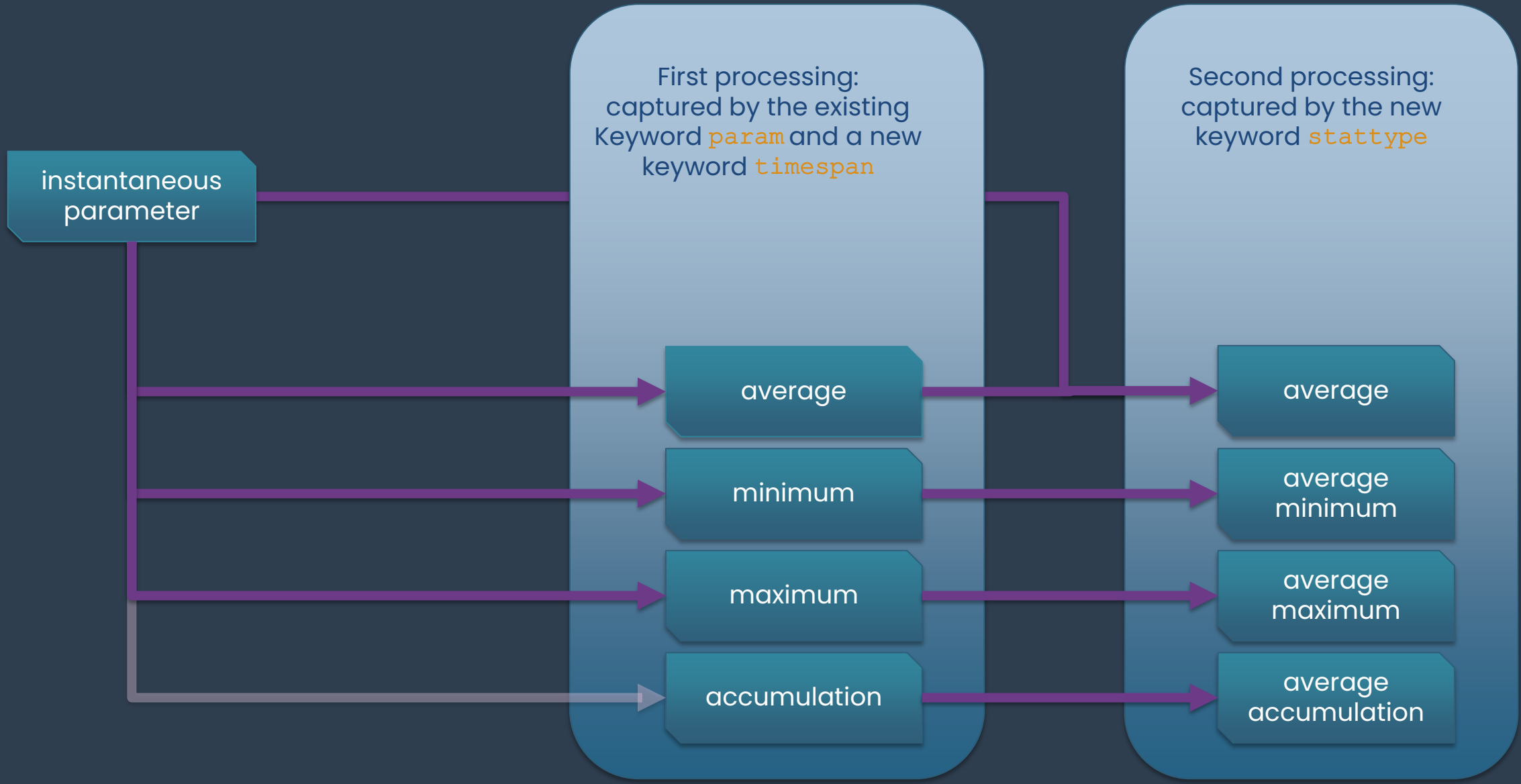

Standardisation of `shortName` and time post-processing

-> The `shortName` will be standardized and use prefixes to indicate their first level of type of time processing:

2t -> min_2t | max_2t | avg_2t

-> The span of the first level of time processing is captured by a new keyword `timespan`:

-> `timespan=1h` (hourly),

-> `timespan=3h` (3-hourly) ,

-> `timespan=from-start` (special, for accumulations)

-> Any additional time processing (type and length) will be captured a new keyword `stattype`:

-> `statype=` Monthly means, monthly maxima, monthly maxima

-> Similar `stattype` for weekly means, daily means, 5-days maximum, etc.

-> This will allow future development of other processing and gives a flexible and generalisable structure.

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Consequence: steps are simpler! step=0-3/3-6/6-9 -> step=3/6/9,timespan=3h

Handling legacy encoding (ongoing work)

-> GRIB2 prescribes the units of parameters

  -> Precipitation in kg m^{-2} in GRIB2 vs m in 50r1

  -> Cloud cover in % in GRIB2 vs fraction in 50r1

  ....

-> Conversion is luckily straightforward

  -> 1 kg m^{-2} ~ 1mm

  -> Conversion factor ~10^3

-> In GRIB1 (and sometimes legacy GRIB2), instantaneous `paramId`s have been used to encode monthly means -> we break this practice

  -> Special handling to continue to decode these parameters correctly

  -> Prevent writing more of these: some parameters become read-only

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Wave streams

-> discontinued from 50r2

-> Move regular wave parameters and 2D wave spectra into respective atm streams:

`wave` -> `oper` , `waef` -> `enfo`, etc.

-> Still logically separated from atmo parameters in the MARS catalogue using a `paramtype` node in the MARS catalogue

-> `paramtype` = `base` -> atmospheric parameters

-> `paramtype` = `wave` -> regular wave parameters

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-> Other use of `paramtype`: `chemical`, `optical`, `tile`, `etc.`

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`ChemId` for atmospheric composition

-> The number of `paramId`s used in atmospheric composition is problematic

-> Conceptually these parameters are 2-dimensional:

  -> A physical property -> mass mixing ratio, emission rate, etc.

  -> chemical species and aerosols -> CH_4 , CO_2

-> We are splitting the existing `paramId`s into a pair of keywords:

  -> `paramId` : now only representing the property

  -> `chemId` : representing the chemical species and aerosols

  -> Example: `param`=mmr , `chem`=CH4

-> We also considered extracting the emission sources into a separate keyword but decided not to do so

  -> Example: `param`=emission from volcanoes vs ~~`param`=emission, `source`=volcanoes~~

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ECMWF

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under `paramtype=chemical`

`Wavelength` keyword for optical parameters

-> We are introducing a new `wavelength` keyword to capture the dependency of the optical parameters into a separate degree of freedom.

-> This will have an impact on the existing optical parameters, particularly in atmospheric composition:

  -> optical depths, etc.

  -> Parameters “at XXX nm”

-> It will support other IFS developments: simulated satellite images, etc.

  -> `Wavelength` ranges

  -> Colour channels

  -> etc.

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under `paramtype=optical`

`modelName` and `modelVersion`

-> We are introducing 2 new ecCodes helper keys to enrich the metadata:

  -> `modelName` (IFS, AIFS, EFAS, NEMO, etc.)

  -> `modelVersion` (cy50r2, v2.0, etc.)

-> In specific cases, these can be used as a MARS keyword (model)

  -> Land Data Assimilation System (LDAS)

  -> Hydrology models

  -> wildfire prediction models

  -> Etc.

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  -> `modelName` (IFS, AIFS, EFAS, NEMO, etc.)

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Tools to support the migration

-> Reference Static Dataset

  -> First prototype available – will be incrementally updated to cover all operational data.

  -> Available on the HPC: `/ec/vol/marsdev4/MTG2_sample_dataset`

  -> Available at `https://data.ecmwf.int/mtg2_sample/`

-> MARS request translator (soon)

  -> Provide a tool to help users migrate their requests

  -> Support conversion of dissemination requests

-> Robust conversion tool: GRIB1 -> GRIB2 (soon)

  -> We will not support the reverse conversion

-> We are available for technical discussions to answer and help member states teams and commercial customers working on the migration.

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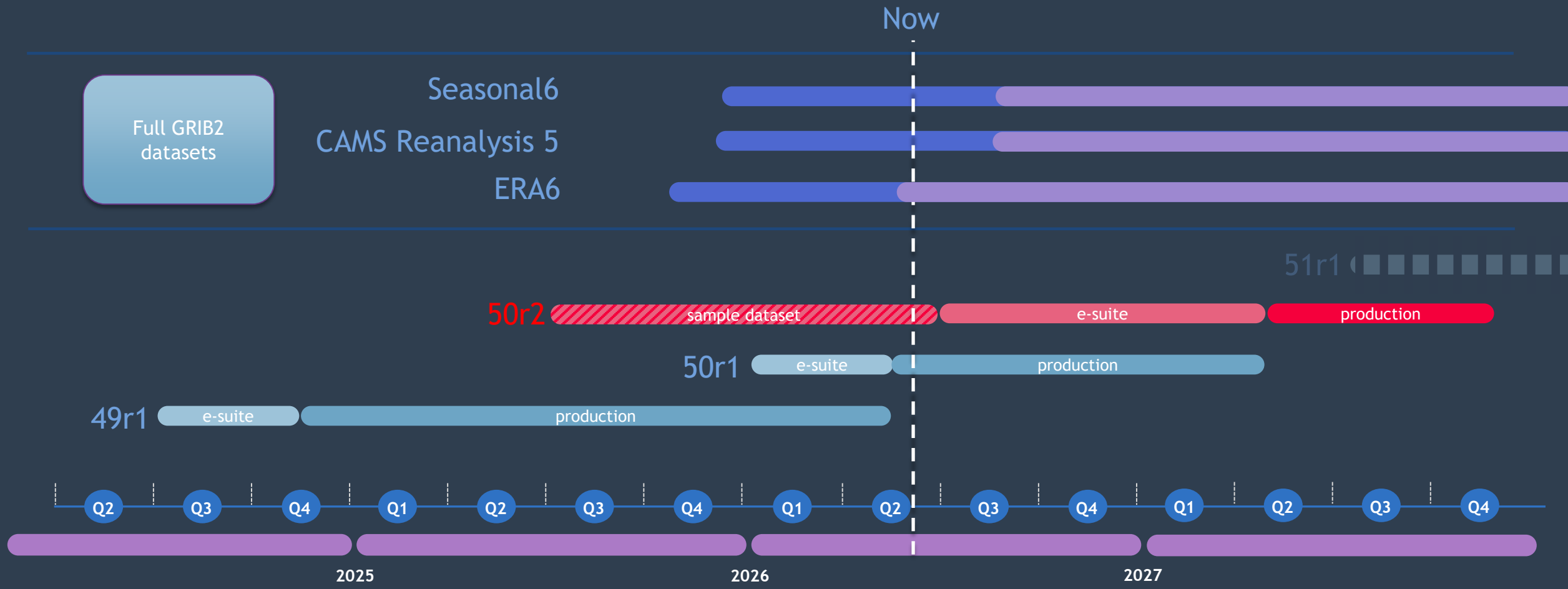
Timeline

50r1: scientific cycle, GRIB mix
50r2: technical cycle, full GRIB2
51r1: scientific cycle, full GRIB2



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Timeline

ERA6 in production
not released!!! 😀

50r1: scientific cycle, GRIB mix
50r2: technical cycle, full GRIB2
51r1: scientific cycle, full GRIB2

Now

Full GRIB2 datasets

Seasonal6

CAMS Reanalysis 5

ERA6

51r1

50r2 sample dataset e-suite production

50r1 e-suite production

49r1 e-suite production

Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4

2025 2026 2027

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StayTuned! Thank you!

ecCodes release notes

MTG2 homepage

Parameter changes

Subscribe MTG2 mailing list

MTG2 reference dataset

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