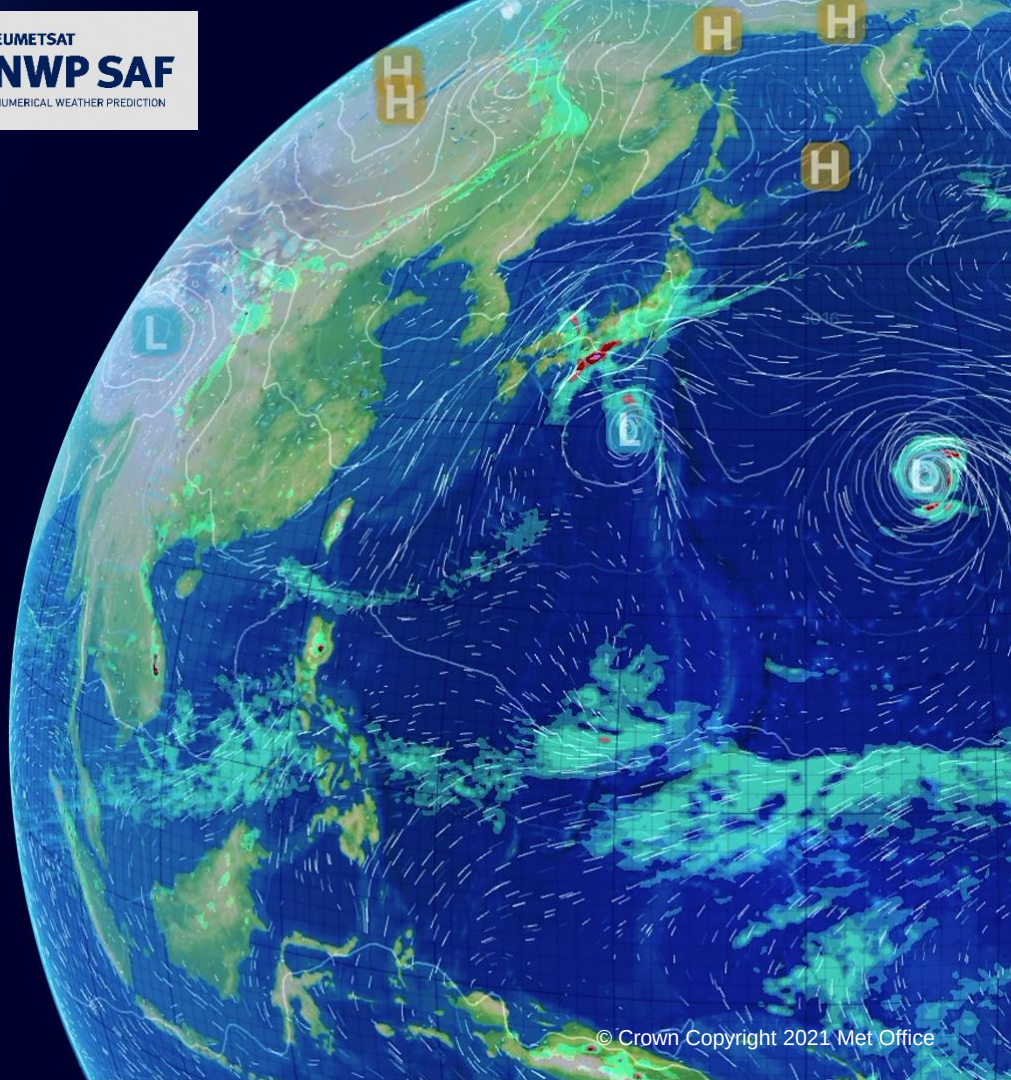
Status of IRSPP

Nigel Atkinson

May 2021



Introduction

- The NWP SAF is developing pre-processing software for Metop-SG-A, Metop-SG-B and MTG-S – all scheduled to launch around 2024
- IRSPP is the processing package for MTG-IRS
- A design document was published in March 2021 at
  https://nwp-saf.eumetsat.int/site/software/irspp/
  and the MAG was invited to provide comments
- We received some comments from EUMETSAT (which have been incorporated into the document), but none so far from MAG members outside EUMETSAT.
- Plan to release an initial version of the software in late 2021, so this is the last chance to provide feedback on its capabilities. (I will also raise this at ITSC)

Functionality

For operational processing of the NRT data (netCDF format, PC compressed)

- Generation of reconstructed radiances (RR) for specified channels. Option to use, or not, the dynamic PC scores
- Option to apply a heavy apodisation (Hamming)
- Simple thinning (1 row in *n*, 1 column in *m*) to reduce volume for global NWP
- BUFR encoding. The user can choose the number of channels/PCs to be included.

More specialised functions

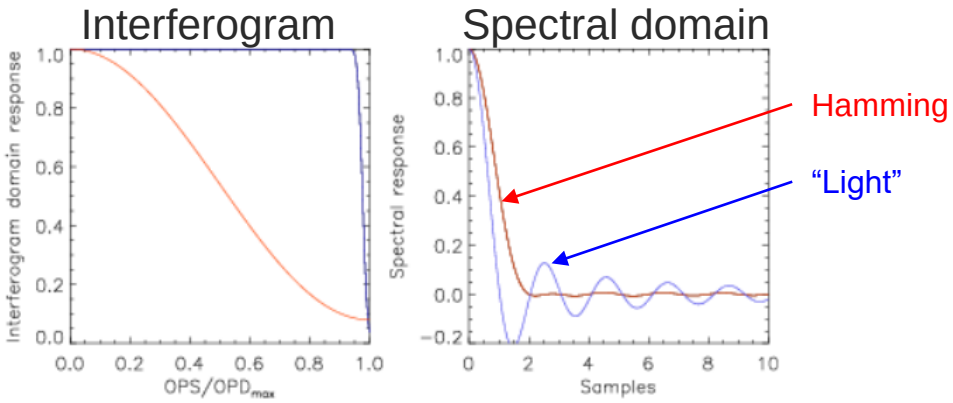
- Generate covariance matrix from many SSS (full-spectrum) files, or from simulated radiances from NWP SAF RadSim package
- Generate eigenvectors from covariance matrix and noise profile (uses LAPACK)
- Generate PC scores and RR from SSS file
- Compute transformation matrix, for transforming to alternative basis function (see later)
- Transform EUMETSAT's PC files to alternative basis function and output the new scores in BUFR

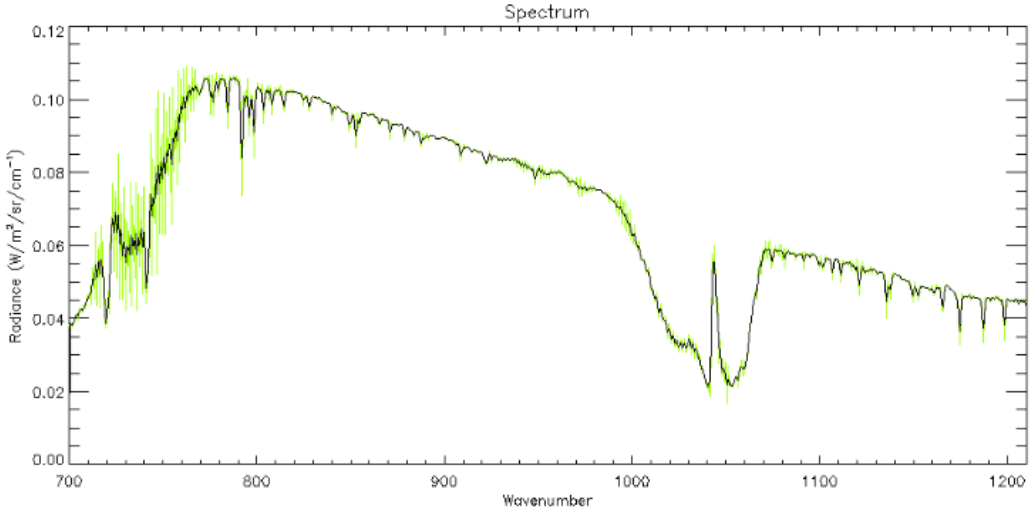
More detail

- Software written in Fortran90. To be released as source code. Link to a few external libraries such as netCDF, hdf5, ecCodes and LAPACK.
- Have tried to make it modular (so that routines can be used elsewhere, if needed)
- A BUFR sequence is proposed. There are a few IRS-specific descriptors (quality flags) that will need approval by WMO. (Also things like satellite identifiers for MTG)
- Not planning to do cloud detection in IRSPP, as the Spatial Sample Quality flag includes a clear/cloudy flag

Option to change apodisation

Easy to change apodisation when working with reconstructed radiances – just modify the eigenvectors





Some RT models struggle with negative sidelobes in the SRF

Not an issue with HT-FRTC in RTTOV

Options to change PC basis function

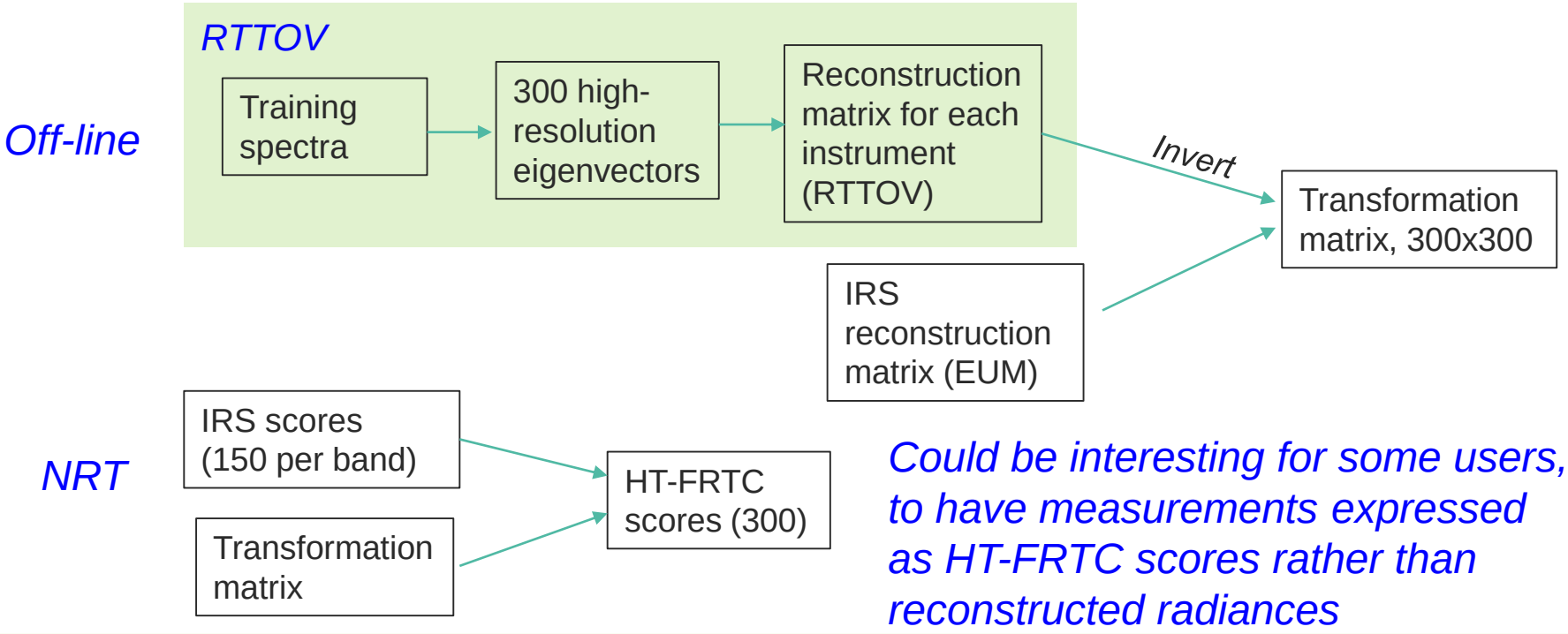
EUMETSAT's PC scores can, if required, be transformed to an alternative basis function via a simple matrix multiplication

Two options for generating the transformation:

1. Use NWP SAF *Radiance Simulator* to generate covariance matrix from a training set of simulated spectra. Hence generate new eigenvectors and a transformation matrix
2. Transform EUM scores (150 in each band) directly into the PC basis function used by *HT-FRTC* (300 scores total, no distinction between bands)

Support for HT-FRTC

- HT-FRTC is the recommended radiative transfer code for IRS in RTTOV



Could be interesting for some users, to have measurements expressed as HT-FRTC scores rather than reconstructed radiances

Has anything been forgotten? Please look at the document if you haven't done so.

We need to satisfy the Steering Group that user requirements have been taken into account

Thank you!

https://nwp-saf.eumetsat.int/site/software/irspp/