# NWP SAF

# Met Office 1D-Var Top-Level Design

Version 1.5 rev 2

23rd July 2013

# NWP SAF Met Office 1D-Var Top-Level Design

This documentation was developed within the context of the EUMETSAT Satellite Application Facility on Numerical Weather Prediction (NWP SAF), under the Cooperation Agreement dated 25 November 1998, between EUMETSAT and the Met Office, UK, by one or more partners within the NWP SAF. The partners in the NWP SAF are the Met Office, ECMWF, KNMI and Météo France.

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| Change record | | | |
|---|---|---|---|
| Version | Date | Author/changed by | Remarks |
| 1.1 | 6/5/04 | A. Collard | Code version 3.1 |
| 1.2 rev 1 | 9/1/07 | E. Pavelin | Revised for code version 3.2 |
| 1.2 rev 2 | 23/1/07 | E. Pavelin | Changed RTTOV 8.5 to 8.7 |
| 1.2 rev 3 | 6/3/07 | E. Pavelin | Clarified calling tree |
| 1.3 | 7/8/09 | E. Pavelin | Revised for code version 3.3 |
| 1.4 | 20/02/12 | P. Weston | Revised for code version 3.4 |
| 1.5 | 13/06/13 | P. Weston | Revised for code version 3.5 |
| 1.5 rev 2 | 23/07/13 | P. Weston | Changed in response to comments from S. Keogh |

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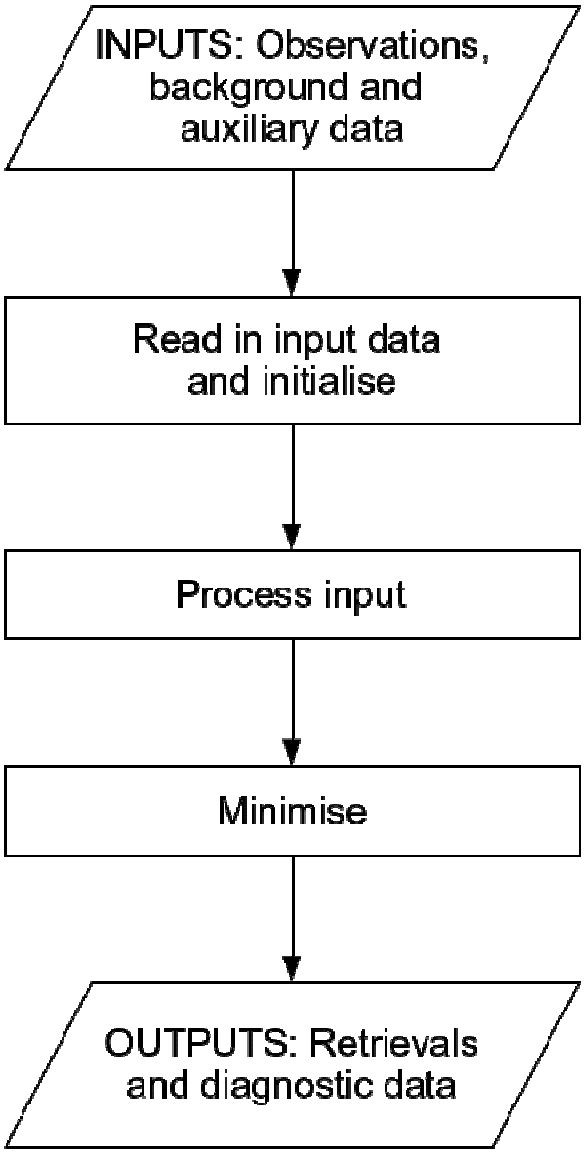
## 1. INTRODUCTION

The Met Office 1D-Var package is designed as a stand-alone retrieval scheme for use with many nadir-viewing passive sounders. It is designed to be flexible in so far as the instrument definition, observations, error covariances, background profiles, channel selection and retrieval parameters are specified in input files. The user may choose which radiative transfer model to use from those supported (RTTOV 7, RTTOV 8.7, RTTOV 9.3, RTTOV 10.2, RTTOV 11.1, RTIASI and Gastropod). If an alternative forward model is required, the user will need to provide their own interface module. The retrieved atmospheric profiles and brightness temperatures are output to an ASCII file.

The overall design of the package is summarised in the following flowcharts.

## 2. OVERVIEW



## 3. INITIALISATION

- Read in control data
- Initialise reading in of observations
  - Observations are read in one at a time in the processing stage
- Read in background
- Read in parameters to be retrieved
- Read in channel selection information
- Initialise RT model and read in RT model coefficients
- Read in background error covariance matrix
  - Includes possible matrix inversion

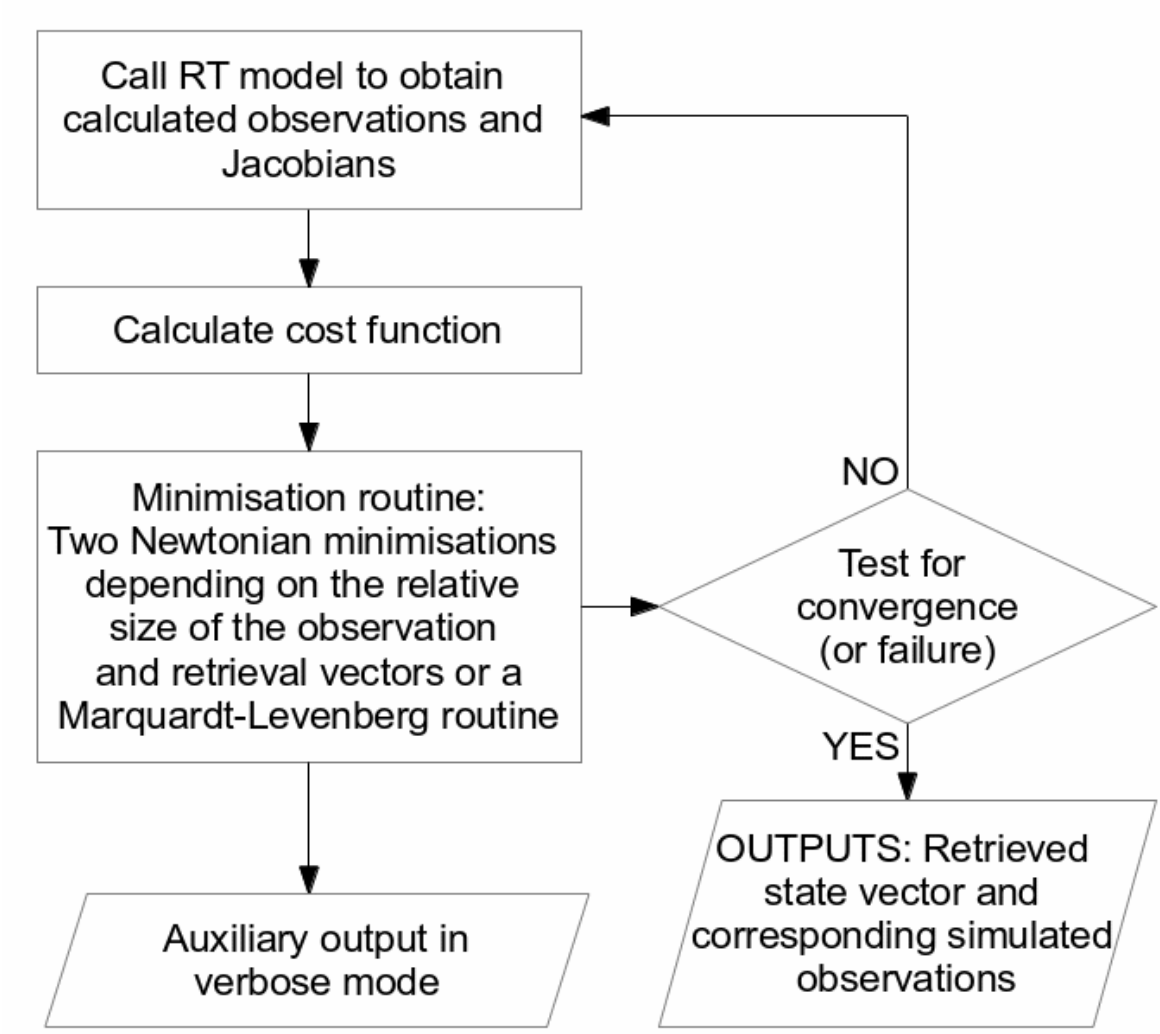
Read in observational + forward model

## 4. PROCESSING INPUT

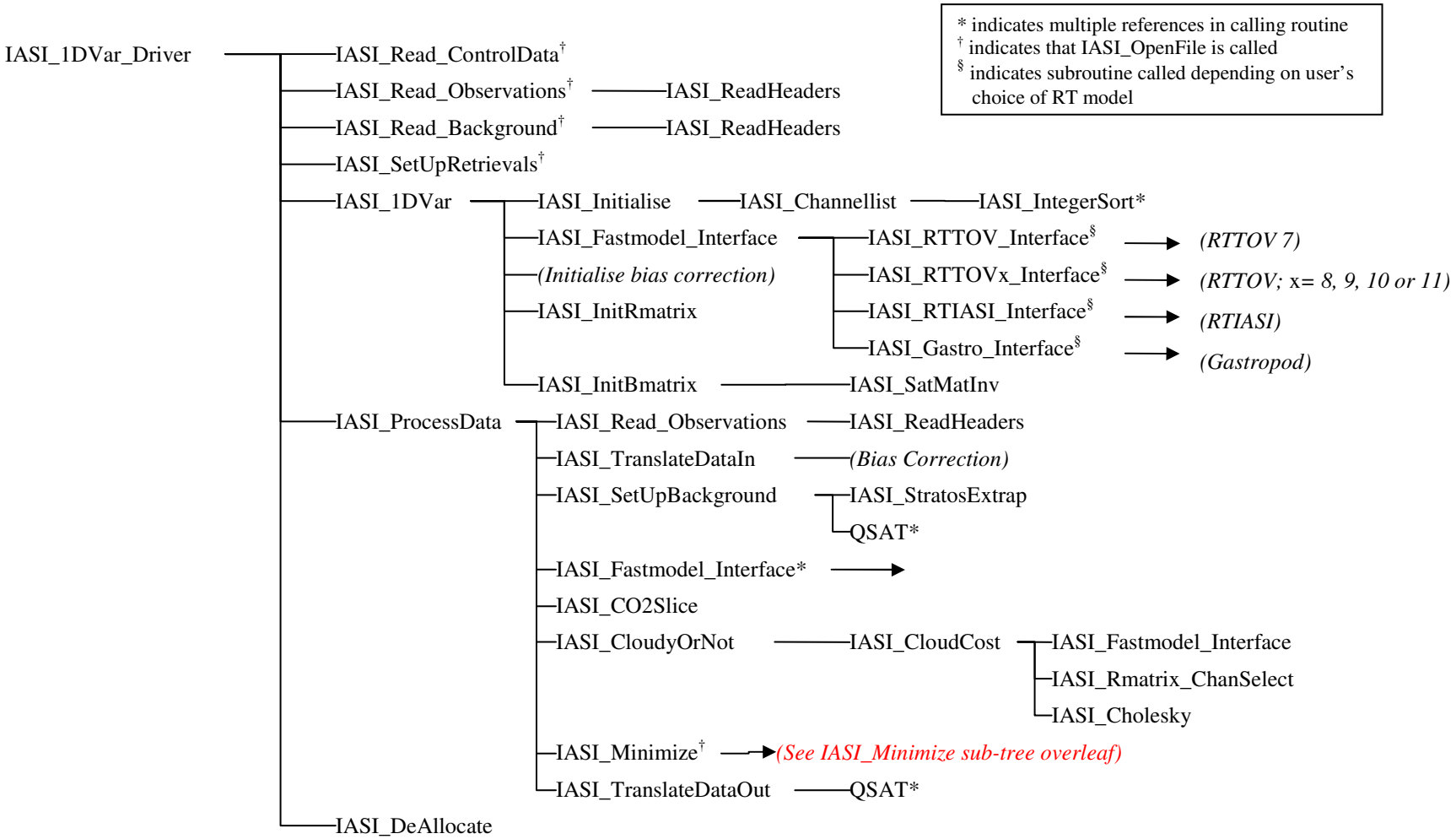
**For each observation:**

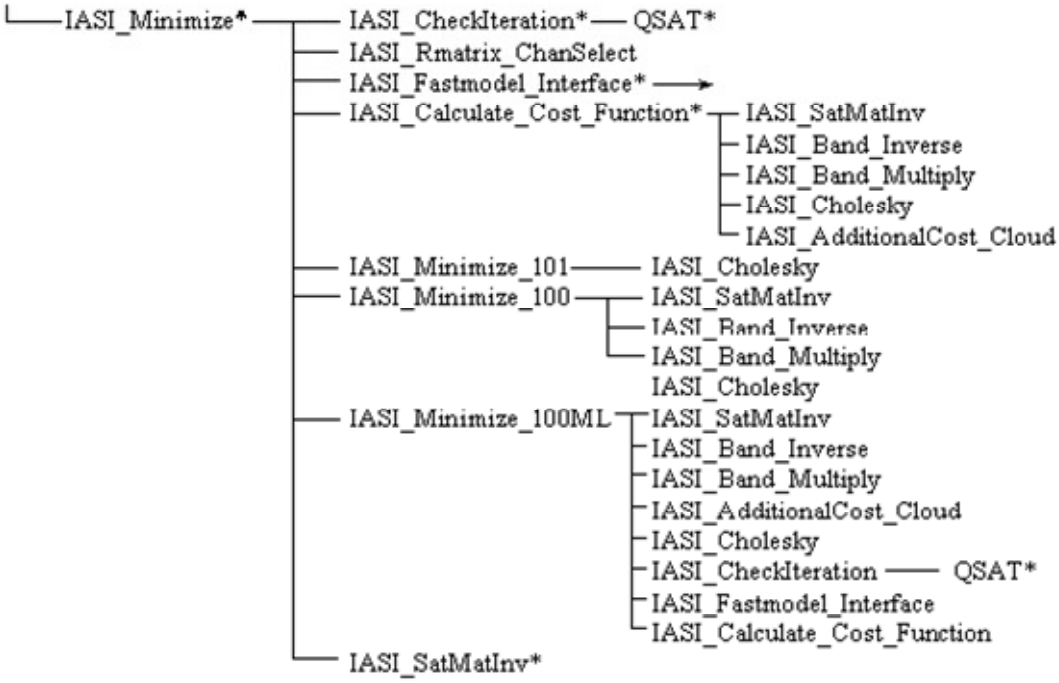
- Read in observation
- User supplied bias correction (optional)
- Convert background profile to correct units
- Produce simulated radiances from background profile
  - Extrapolate temperature profile at top of atmosphere (optional)
- Do cloud detection (optional)
- Do $CO_2$ slicing for first guess cloud properties (cloudy retrievals only)
- Obtain emissivity from atlas (optional)

## 5. MINIMISATION AND OUTPUT



## 6. SUBROUTINE CALLING TREE



## 6. SUBROUTINE CALLING TREE (CONTINUED)

*N.B.: The following section of the calling tree follows on from IASI_Minimize on the previous page.*