

Cross Track Infrared and Microwave Sounding Suite (CrIMSS) EDR Algorithm

Denise Hagan¹, Chunming Wang¹, Degui Gu¹, Joseph Predina², Ronald Glumb²
Jean-Luc Moncet³, Ned Snell³, Xiu Liu³

Affiliations: ¹ Northrup Grumman Aerospace Systems, Redondo Beach, California USA
² ITT Geospatial Systems, Fort Wayne, Indiana, USA
³ Atmospheric and Environmental Research, Inc., Lexington, Massachusetts, USA



Algorithm Overview

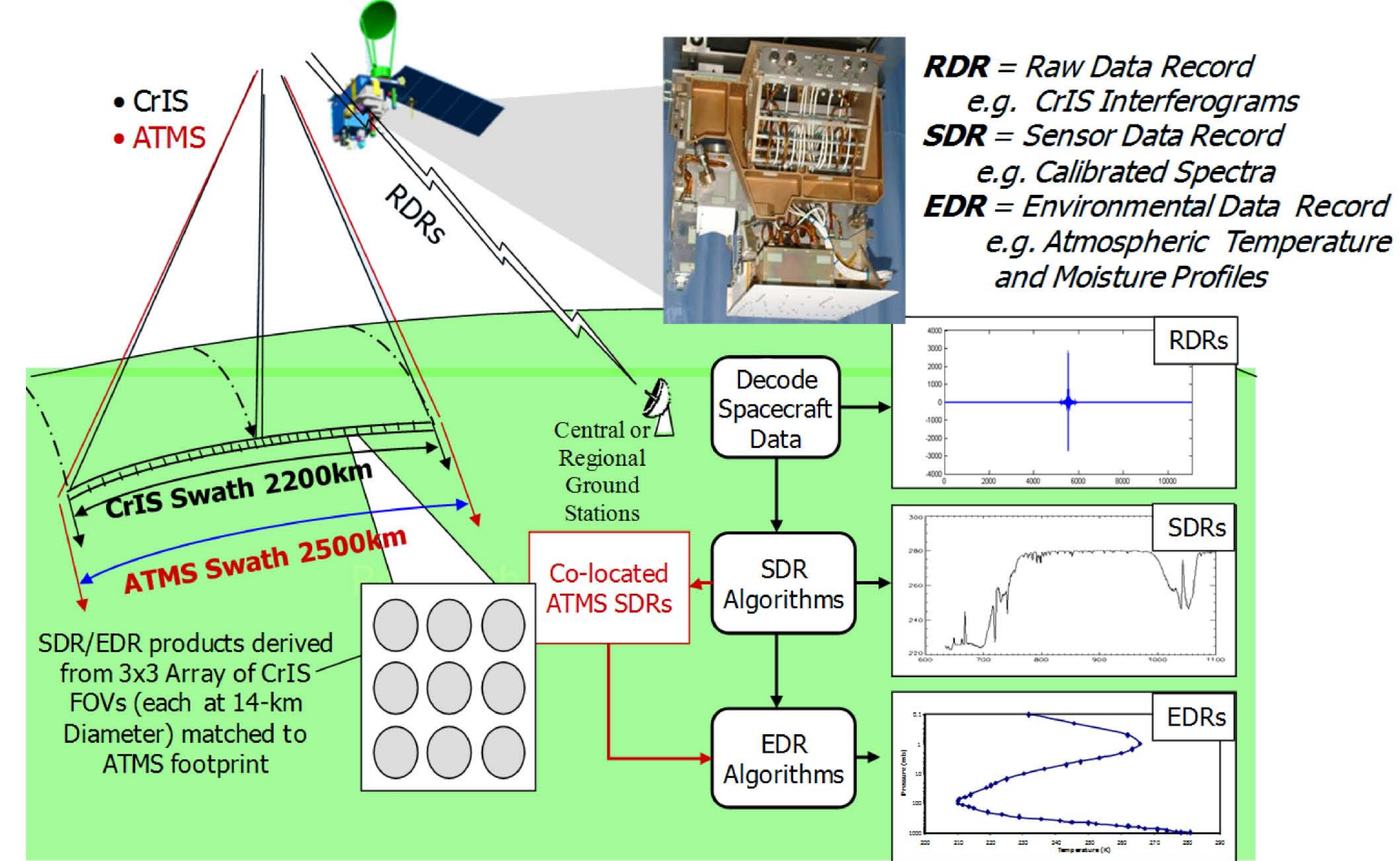
EDR Algorithm Products

The CrIMSS EDR algorithm produces three EDRs: Temperature Profile, Moisture Profile and Pressure Profile (derived from the retrieved Temperature and Moisture EDRs)

The CrIMSS EDR retrieval algorithm was developed by Atmospheric Environmental Research (AER) for the CrIS sensor contractor (ITT), and was integrated into IDPS by NGAS. NGAS provided several code enhancements during the integration process.

The CrIMSS EDR algorithm is based on a joint infrared and microwave physical retrieval and cloud-clearing methodology, similar to EOS AIRS algorithm, but otherwise deviates with some significant improvements:

- (1) Performs simultaneous retrieval of atmospheric temperature, moisture, pressure and ozone profiles and surface skin temperature and spectral emissivity, using both IR and MW radiances
- (2) Incorporates very fast and accurate Optimal Spectral Sampling (OSS) Radiative Transfer Model for IR and microwave
- (3) Uses Empirical Orthogonal Functions (EOFs) to characterize and measure the retrieved geophysical parameters; the retrieval is done in the EOF space



Calibrated Radiance Spectra to Retrieved Atmospheric Parameters in Seven Steps

Algorithm Input Data

CrIS SDRs
Re-Mapped ATMS SDRs
Surface Pressure from NCEP
Surface Temperature from NCEP
Land Fraction

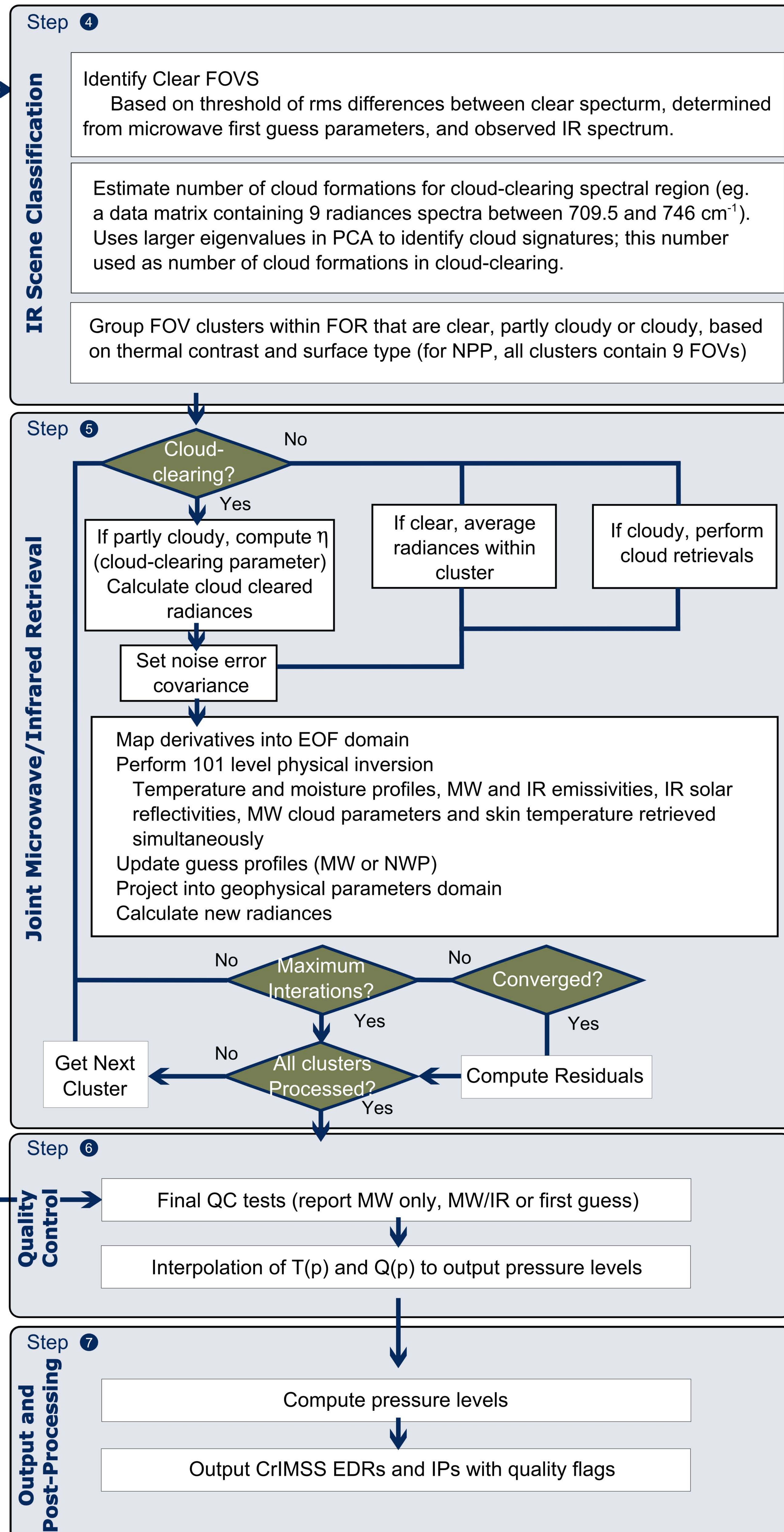
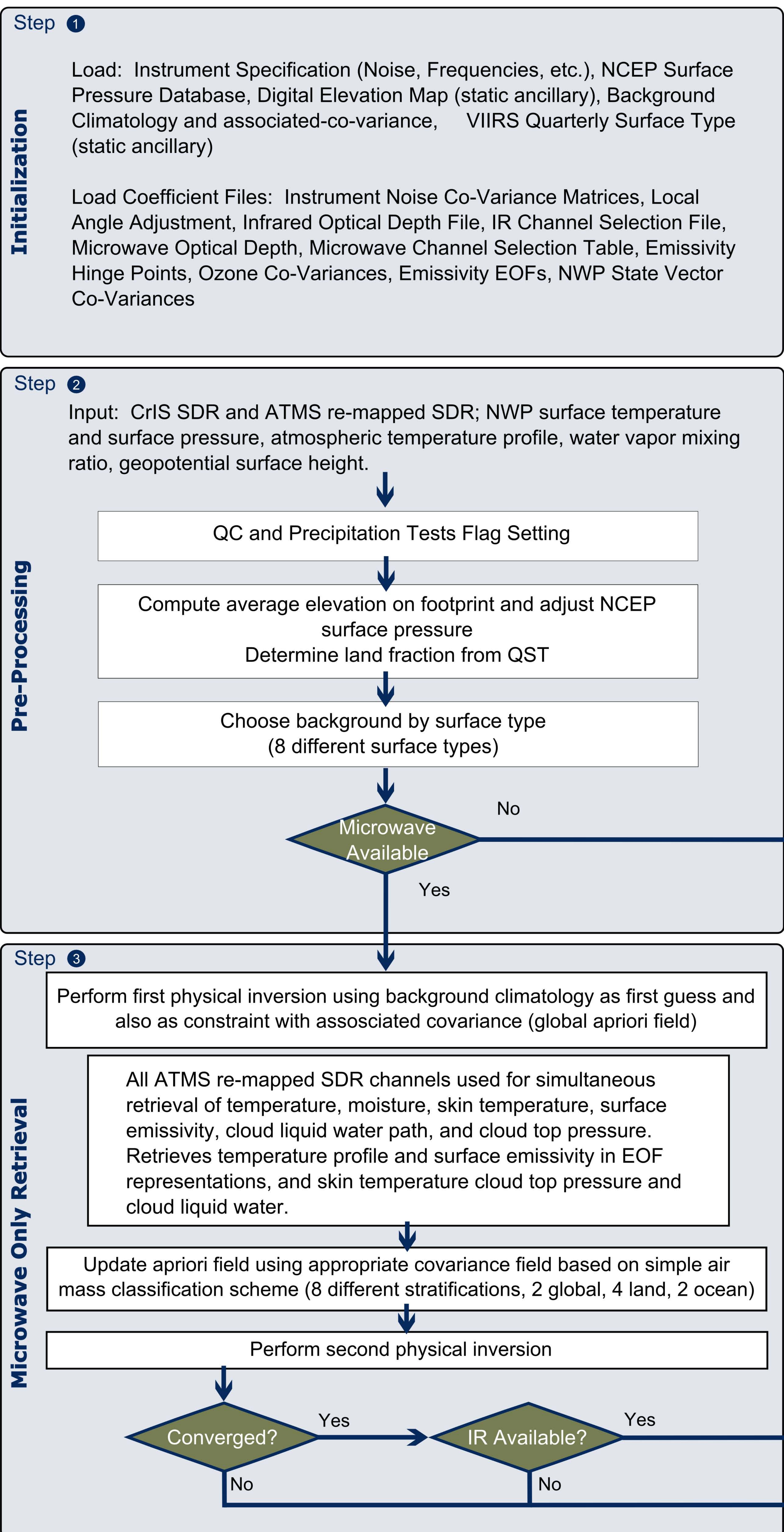
EDR Algorithm Steps

- 1 Initialization
- 2 Input and Pre-processing
- 3 Microwave-only (MW) Retrieval
- 4 Scene Classification
- 5 Microwave/Infrared Retrieval (MW+IR)
- 6 Quality Control
- 7 Output and Post-processing

Retrieved Surface and Atmosphere Parameters

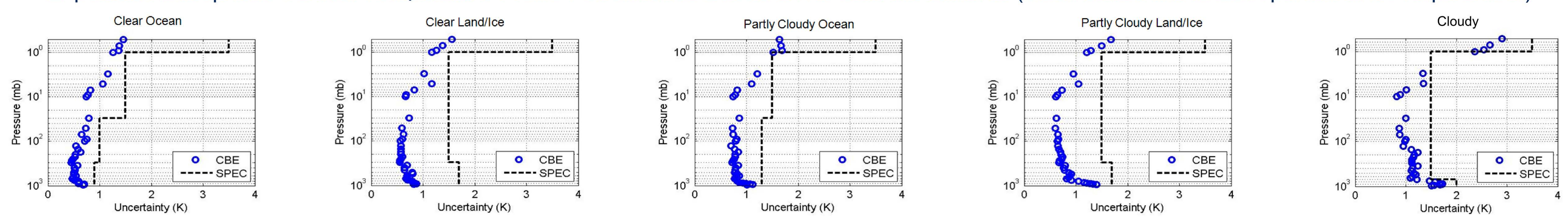
Temperature Profile 42 Layers (reconstructed from 20 temperature EOFs)
Moisture Profile 22 Layers (reconstructed from 10 moisture EOFs)
Surface Temperature
Surface MW Emissivity (reconstructed from 5 MW emissivity EOFs)
Surface IR Emissivity (at 12 frequency hinge-points)
Surface IR Reflectance (at 12 frequency hinge-points)
MW Cloud Top Pressure and Cloud Liquid Water Path
Ozone Profile (reconstructed from 7 EOFs)

CrIMSS EDR Algorithm Description



Performance

Expected Atmospheric Vertical Temperature Profile Performance Based on As-Built Instruments (black dotted line is EDR performance requirement)



Expected Atmospheric Vertical Moisture Profile Performance Based on As-Built Instruments (black dotted line is EDR performance requirement)

