

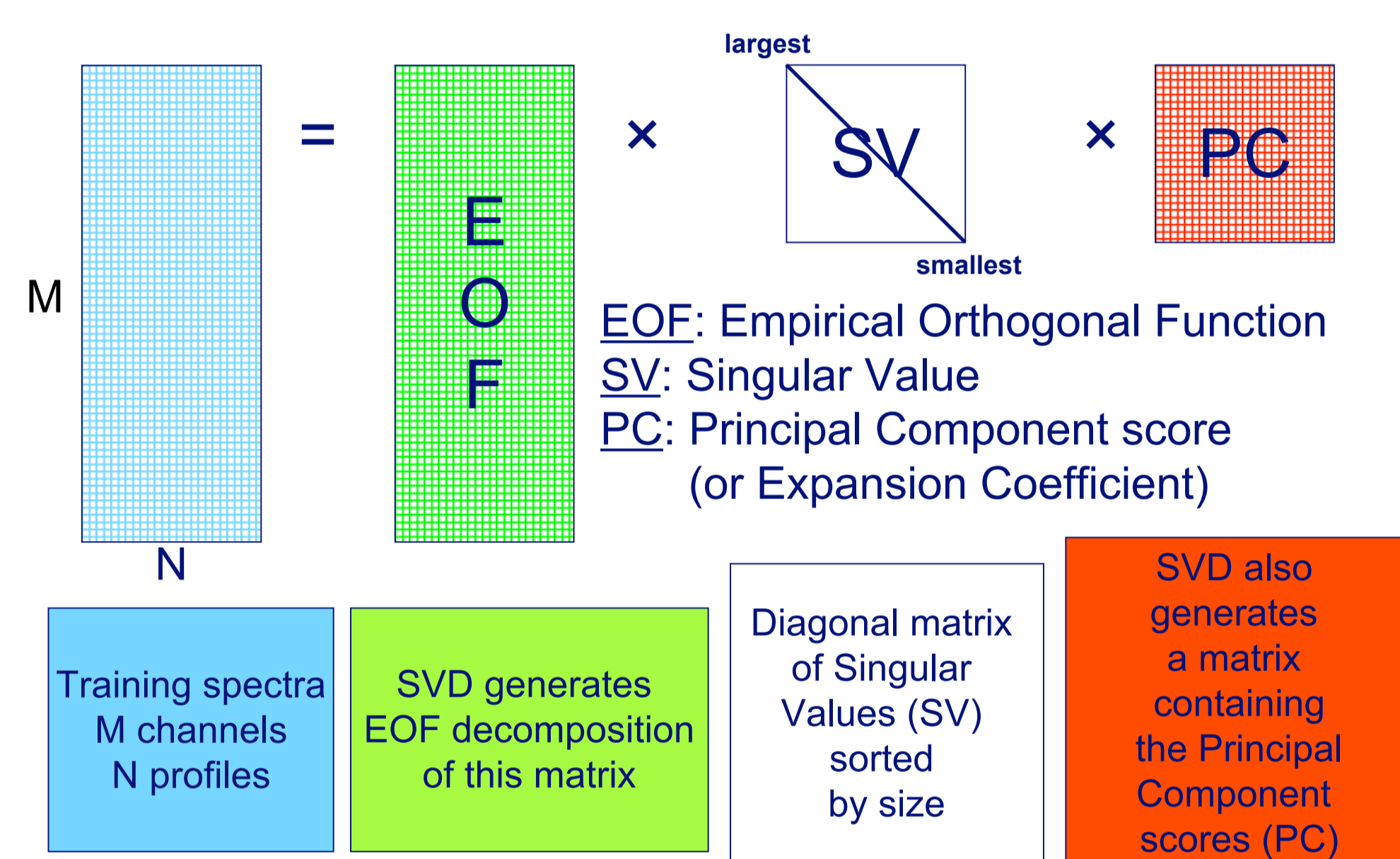
IASI data is widely used in NWP and has a positive impact on forecast skill. However, the data is conservatively used, only a few hundred channels are assimilated with most of these being temperature sounding channels. Furthermore, the assimilation of IASI data over land is restricted to channels that peak significantly above the surface. Operational centres are beginning to utilise some data in the presence of clouds but such use is still in its infancy and no attempt is being made operationally to utilise data within or below cirrus clouds. Here we present a principal component radiative transfer techniques that allow the fast forward modelling of all 8461 channels of IASI. We present results in clear skies using data gathered as part of the JAIVEX campaign. A second poster presents results of retrievals in the presence of clouds.

## 1. An introduction to principal component radiative transfer

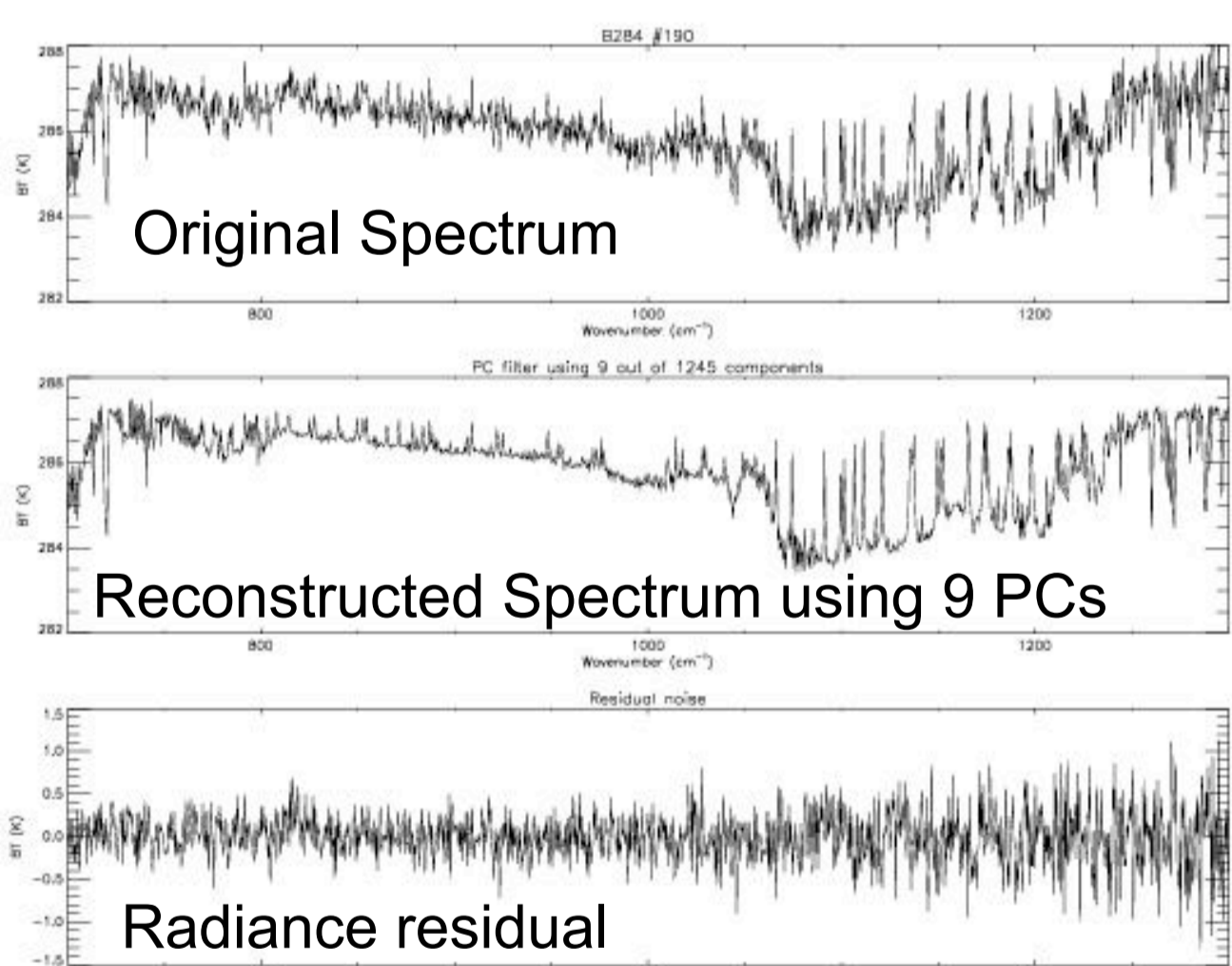
### The Havemann-Taylor Fast Radiative Transfer (HT-FRTC) Code – key facts

- Wavelength range: 0.4 - 16.5  $\mu\text{m}$  (to be extended)
- Spectral resolution currently down to 0.0025  $\text{cm}^{-1}$
- Atmospheric absorption by water vapour and atmospheric gases included
- Aerosol and clouds are included can represent full treatment of scattering in solar and thermal infrared
- Accuracy: Better than 0.1 K in Tb
- Speed: calculation time < 1s for calculating 8500 IASI satellite instrument channels
- Spectrally resolved surface emissivity (represented by 15 PCs)

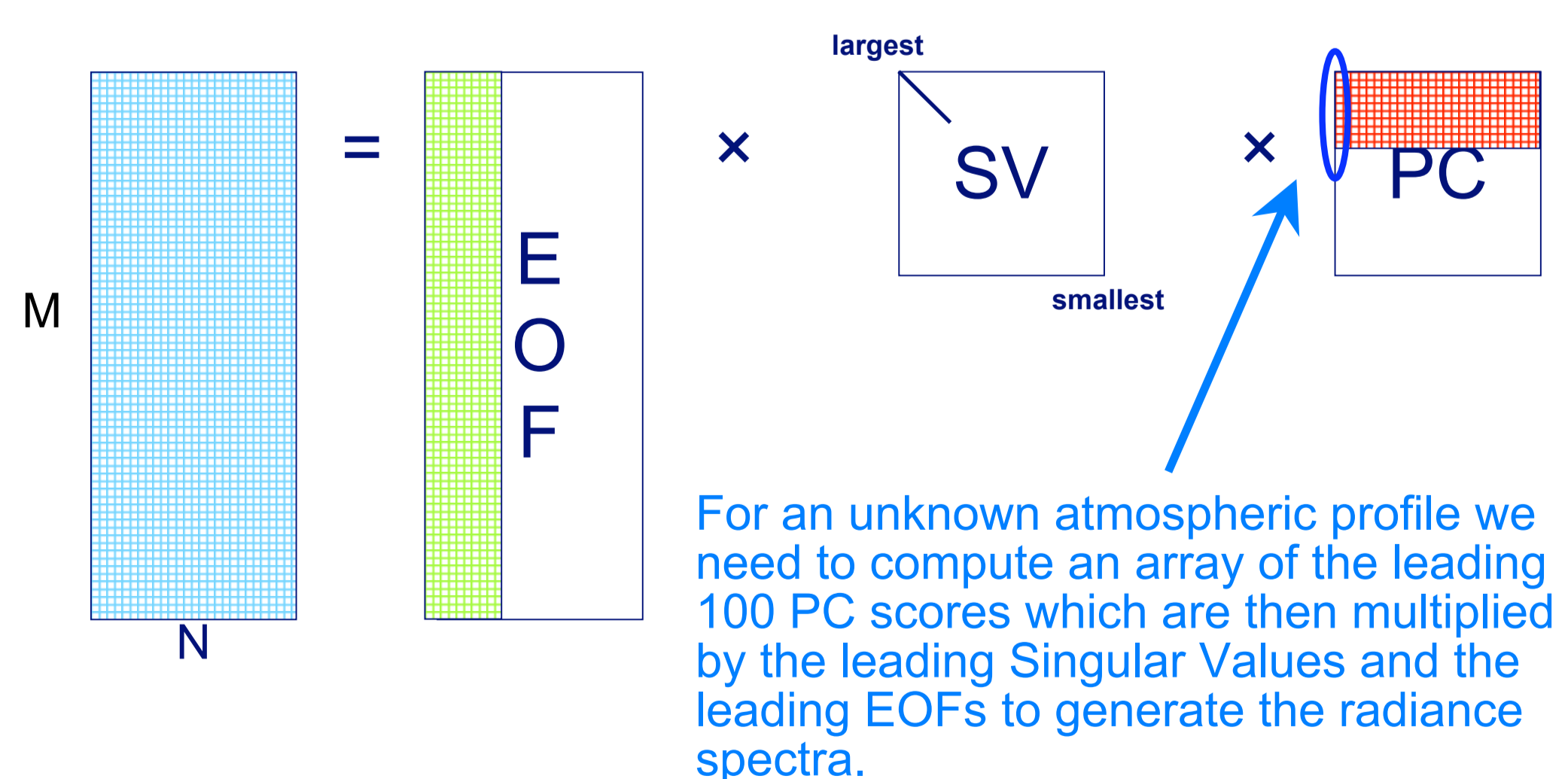
### Offline calculations



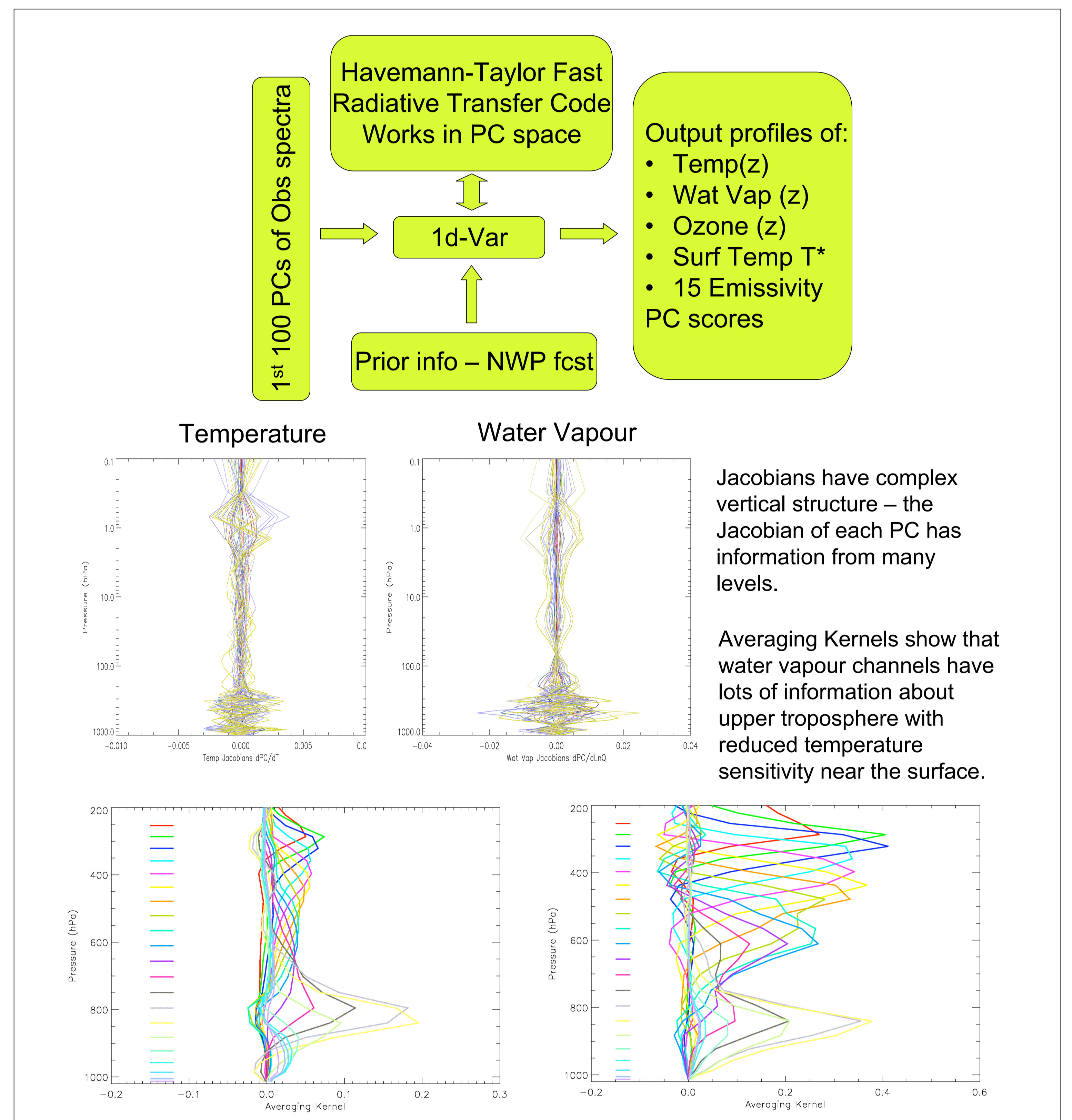
### PCs allow you to represent full spectral information in a compact manner



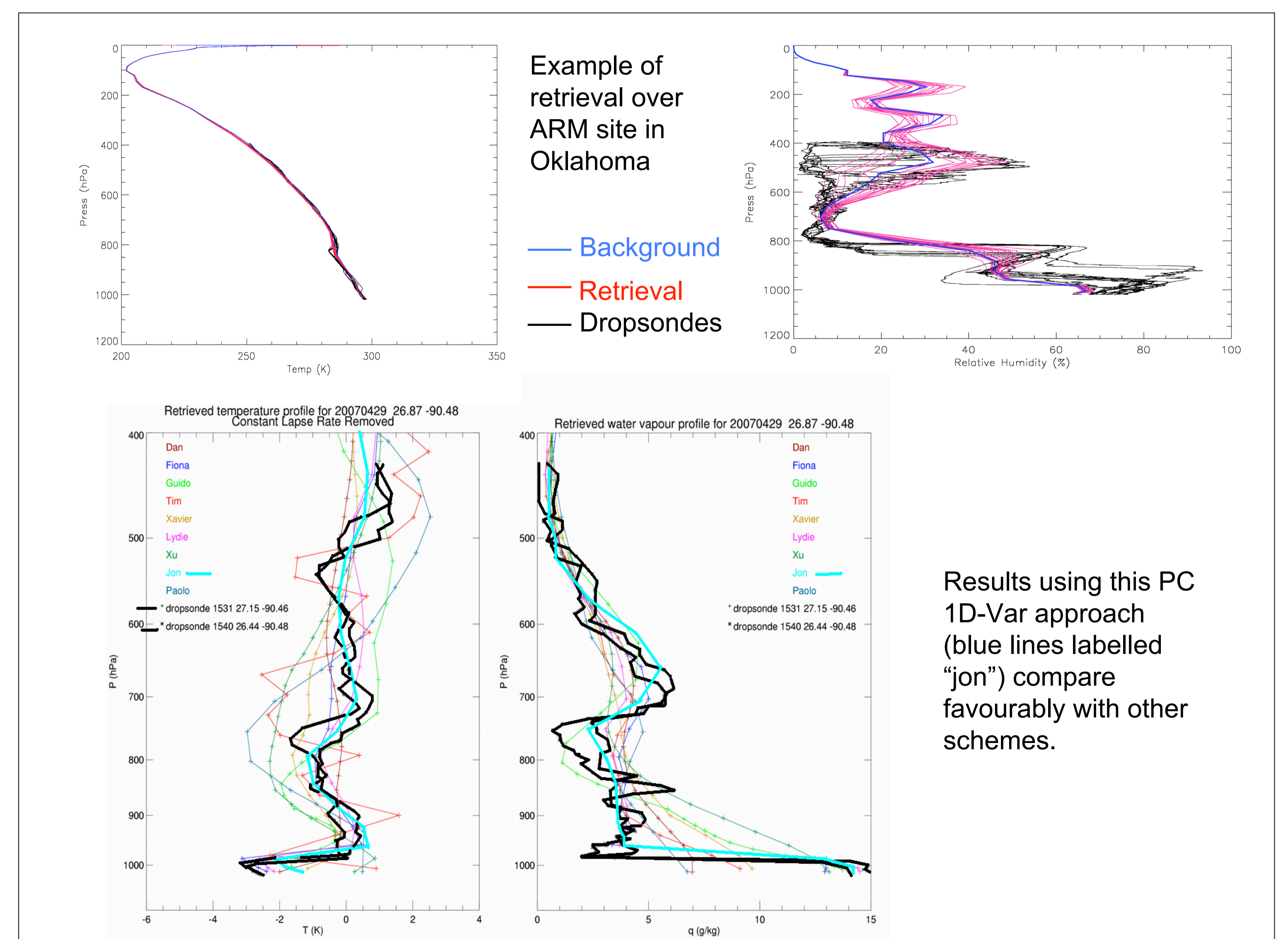
- The leading PCs contain all the useful information
- We find that 100 PCs are enough to represent all the information from an IASI spectrum of 8461 radiances
- If we can develop a radiative transfer model that predicts PCs instead of radiances then things will speed up considerably
- This is the basis behind the HT-FRTC



## 2. PC 1d-Var



## 3. Results from JAIVEX – clear skies



International TOVS Study Conference, 17<sup>th</sup>, ITSC-17, Monterey, CA, 14-20 April 2010.  
Madison, WI, University of Wisconsin-Madison, Space Science and Engineering Center,  
Cooperative Institute for Meteorological Satellite Studies, 2011.