Development and validation of Gastropod
a fast radiative transfer operator for the advanced
infrared sounders

V. Sherlock†, A. Collard* and R. Saunders*

† National Institute of Water and Atmospheric Research, NZ
* Satellite Applications, NWP Division, The Met Office, UK

Thanks to Scott Hannon, Sergio De Souza Machado, UMBC, USA
GasTRoPOD model development strategy

- Prediction scheme: PFAAST [Hannon et al., 1996]
  * separate water vapour line and continuum absorption
  * weighted regression

- NEW in Gastropod!
  * adjoint and K code
  * single H$_2$O line absorption regression scheme
  * simple calculation of layer mean quantities (vertical res.)
  * profile I/O on arbitrary pressure levels

- Convolved transmittance data: Scott Hannon, UMBC
Validation and intercomparison results

- Forward model errors (nadir view), 176 independent profiles
  ECMWF 50L diverse profile set [Chevallier, 1999]
  - Line-by-line radiative transfer kCARTA v1.10
  - RTTOV-7 error estimates [Matricardi et al., 2001]

- Jacobian error estimates (dependent profile set)

- Focus on the H$_2$O $\nu_2$ band
Line-by-line validation of the Gastropod forward model

![Graph showing BIAS (K) and STANDARD DEVIATION (K) over wavenumber [cm⁻¹]]
Line-by-line model validation of Gastropod Jacobians
Summary and perspectives

- Gastropod: accurate radiative transfer
  robust error characteristics
    $\mu \sigma GMoF \sim 0.0 < 0.1 \text{ K} < 10$
  separation of H$_2$O line and continuum absorption

- Water vapour line absorption modelling study
  identification of lead predictors for line absorption
  collinearity: identification of an optimal subset of predictors

  → an improved description of H$_2$O line absorption