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

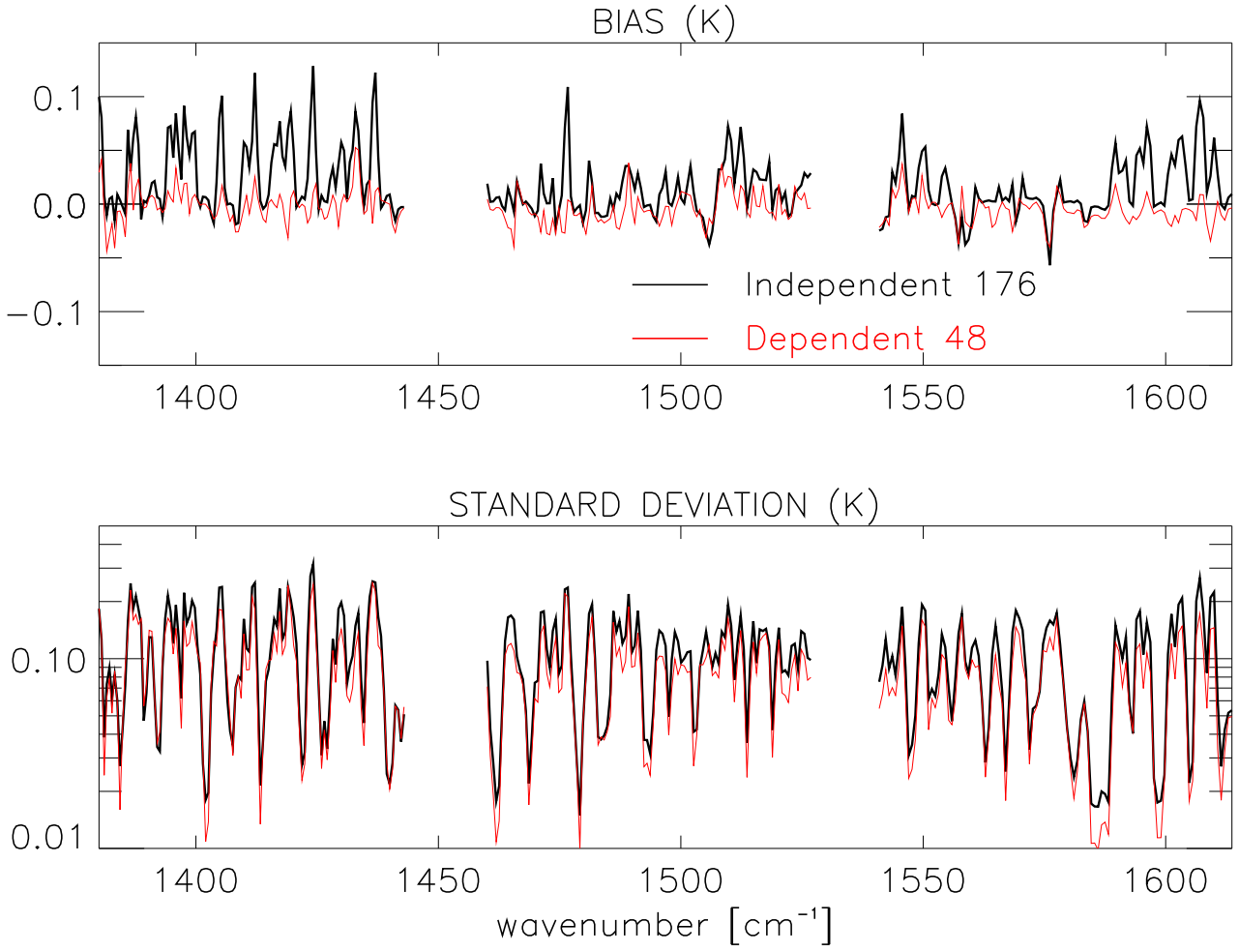
- NEW in Gastropod !
  - ⋆ adjoint and K code
  - ⋆ single H_2O line absorption regression scheme
  - ⋆ simple calculation of layer mean quantities (vertical res.)
  - ⋆ profile I/O on arbitrary pressure levels

- Convolved transmittance data: Scott Hannon, UMBC

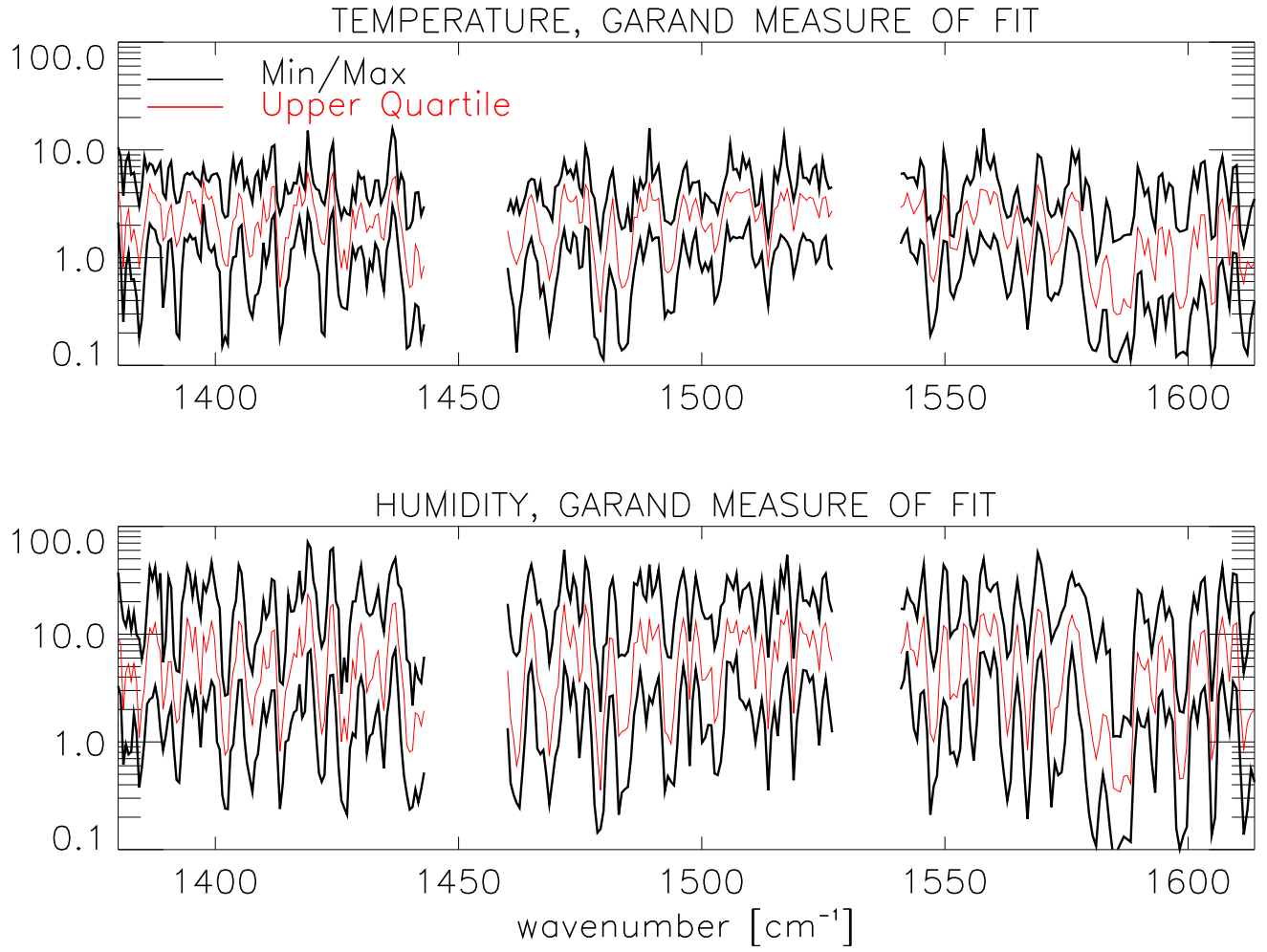
Validation and intercomparison results

- 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_2O ν_2 band

Line-by-line validation of the Gastropod forward model



Line-by-line model validation of Gastropod Jacobians



Summary and perspectives

- Gastropod: accurate radiative transfer
  robust error characteristics

μ	σ	$GMoF$
~ 0.0	< 0.1 K	< 10

  $\star$ separation of H_2O line and continuum absorption

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

  $\rightarrow$ an improved description of H_2O line absorption