Update on the RTTOV SURFEM-OCEAN implementation

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Thanks to James Hocking (and Dave Rundle)

ISSI meeting

18th October 2022

SURFEM-OCEAN in RTTOV

SURFEM-OCEAN has been ported from Matlab to Fortran and incorporated and tested in RTTOV:

- Direct 
- Tangent Linear 
- Adjoint / K 

It will be released in RTTOV version 13.2 which is aimed for the end of November 2022 (select fastem_version = 7)

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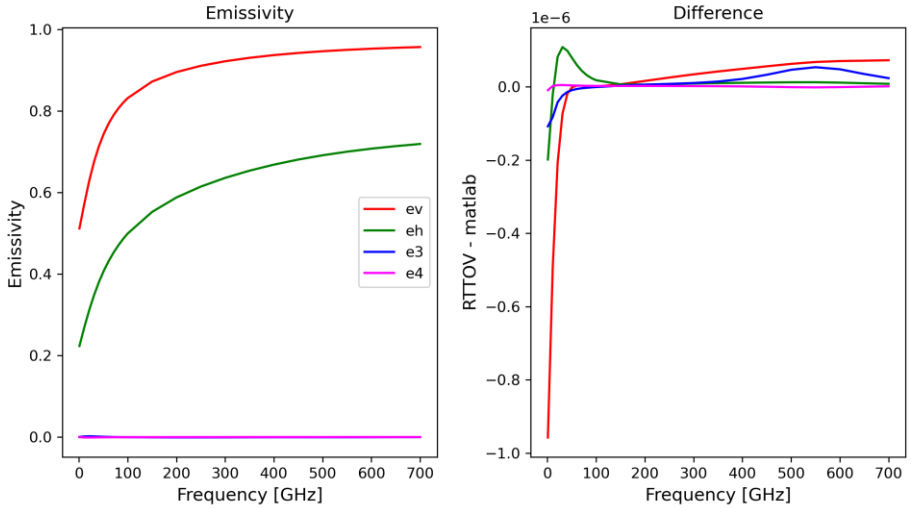
Feedback from internal meetings has been positive

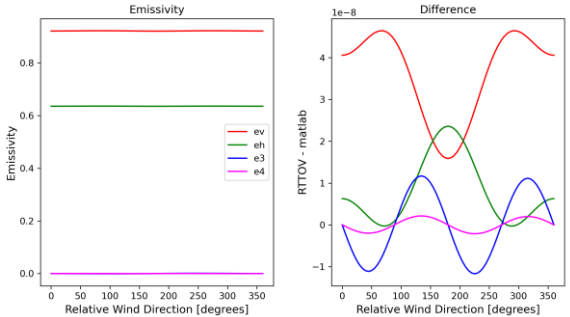
Direct code validation

Tiny residual differences due to precision differences. Single precision Non-Mat Neural Network coefficients were provided for RTTOV. This is very good.

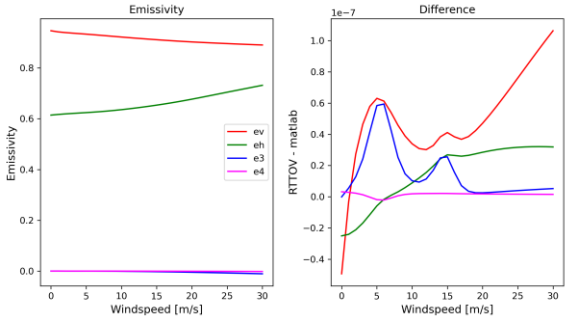
Frequency



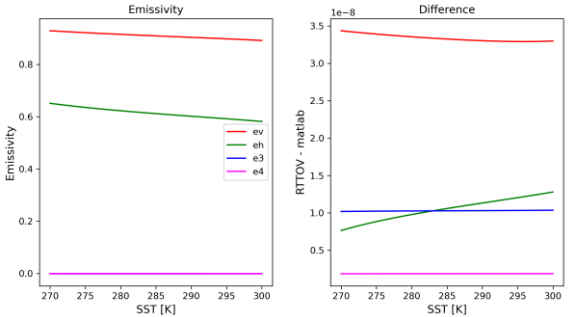
RWD



Windspeed



SST



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Surface emissivity models in RTTOV

Relative wind direction added

All science updated: permittivity, surface roughness and foam

Foam model reverted to FASTEM-3

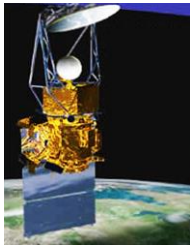
Relative wind direction reverted to FASTEM-4

Relative wind direction added. More neurons.

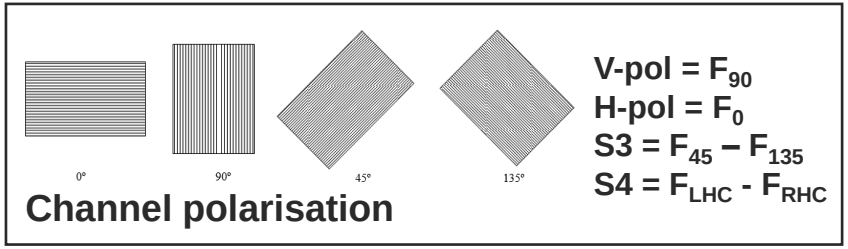
	RTTOV version	Linear regression	Neural Networks	Relative wind direction as input	Foam fraction an optional input	Reflectivity calculated (not set to 1 – ε or zero)	Spectral coverage (GHz)
FASTEM-3	8.0	✓		✓			20 - 60
FASTEM-4	10.0	✓		✓	✓		1.4 - 410
FASTEM-5	10.2	✓		✓	✓		1.4 - 410
FASTEM-6	11.2	✓		✓	✓	✓	1.4 - 200
TESSEM2	12.0		✓				1.4 - 700
SURFEM OCEAN	13.2		✓	✓		✓	0.5 - 700

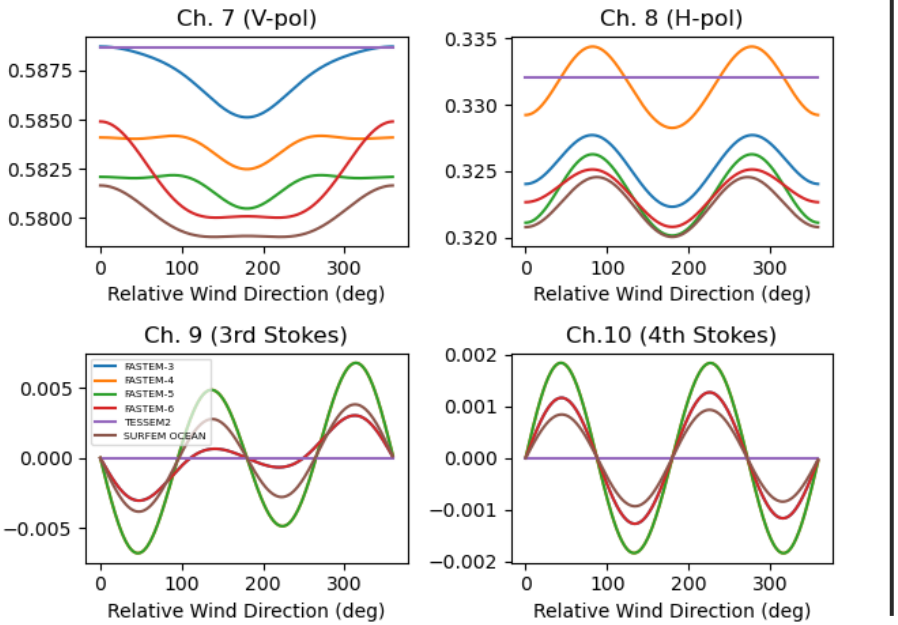
$$relative\ wind\ direction = satellite\ azimuth - wind\ direction$$

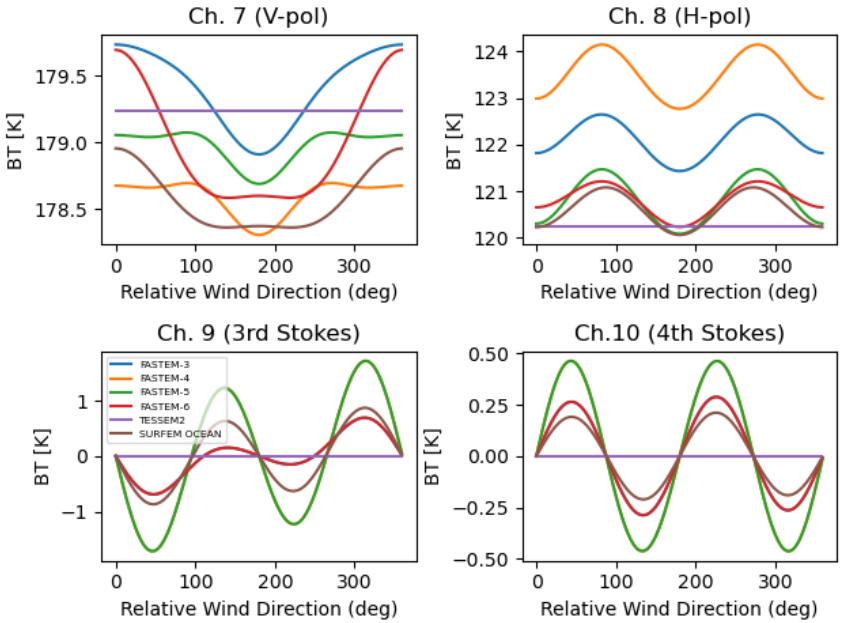
Results: Windsat



Coriolis satellite



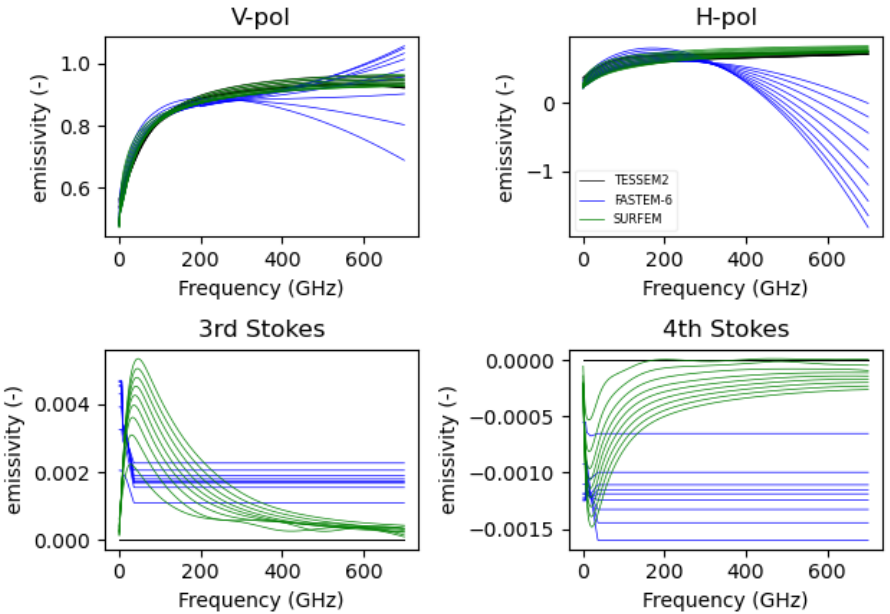




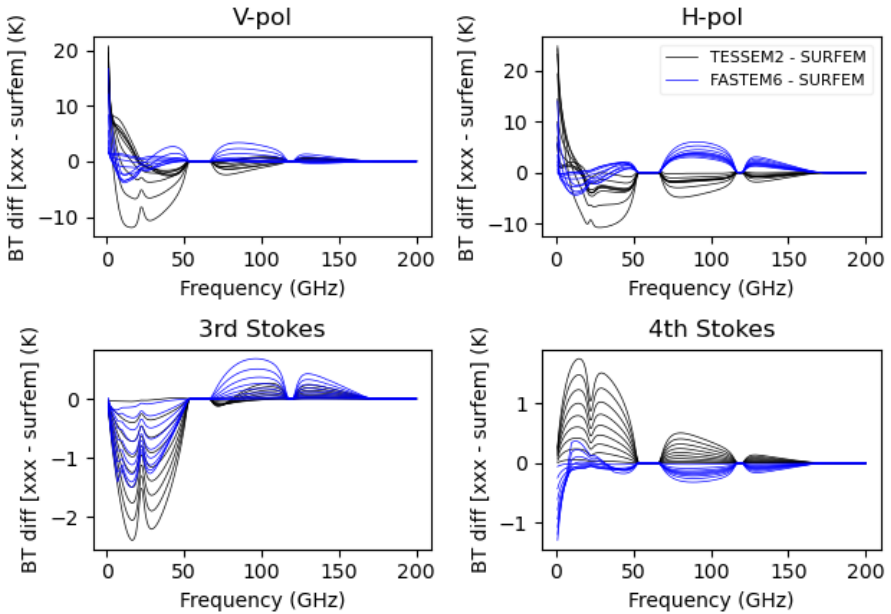
$$relative\ wind\ direction = satellite\ azimuth - wind\ direction$$

Results: Hyperspectral

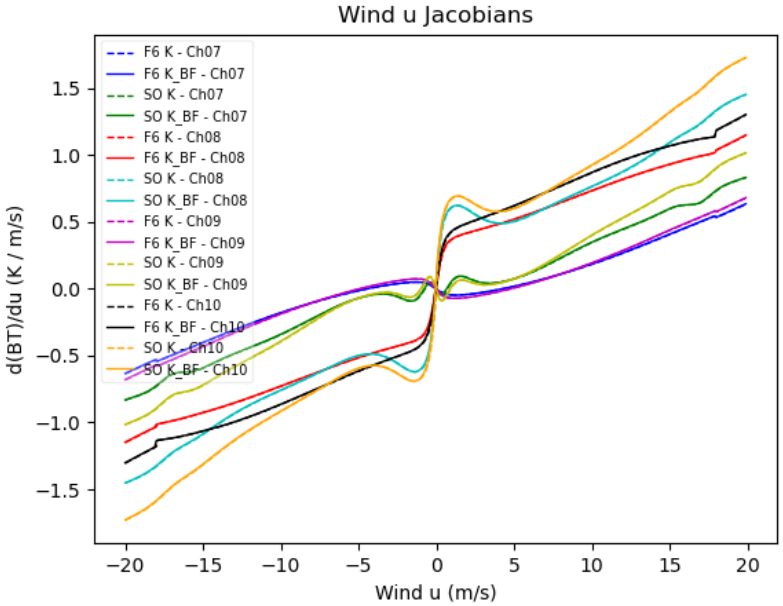
Emissivity: Variation due to 9 windspeeds between 5.65 - 36.22 m/s

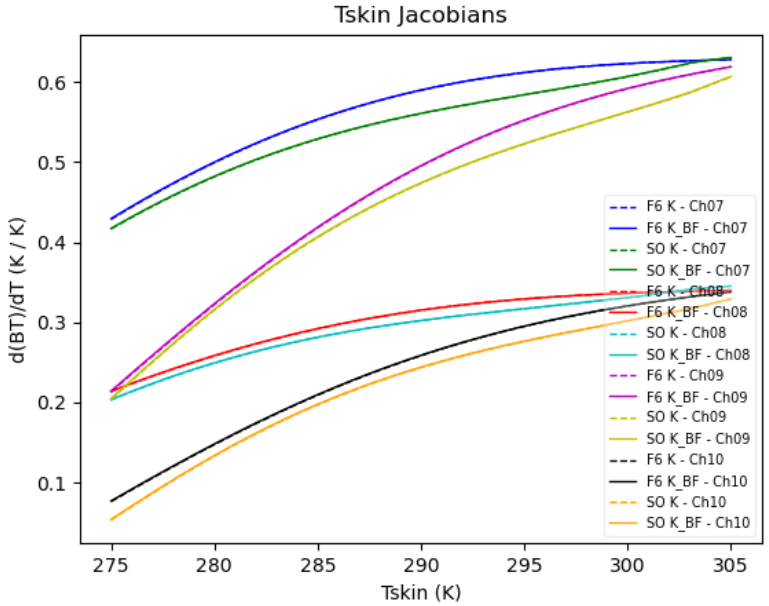


BT diffs: Variation due to 9 windspeeds between 5.65 - 36.22 m/s



TL/AD/K code validation/results





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The End