Coastal Water Algorithm for OLCI

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Overview

Heritage of MERIS, Processor by ACRI / Argans

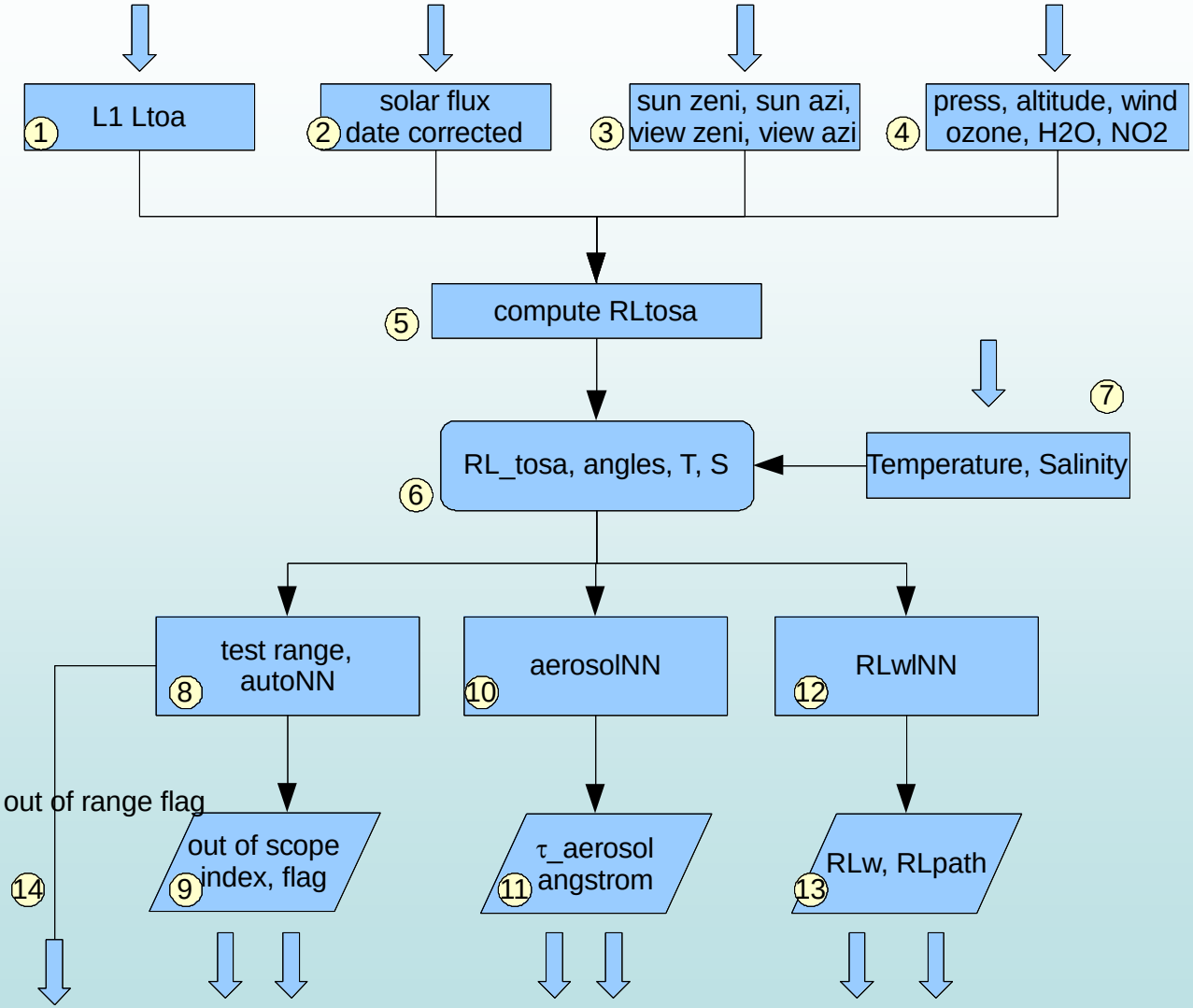
The coastal water algorithm for OLCI consists of 2 parts:

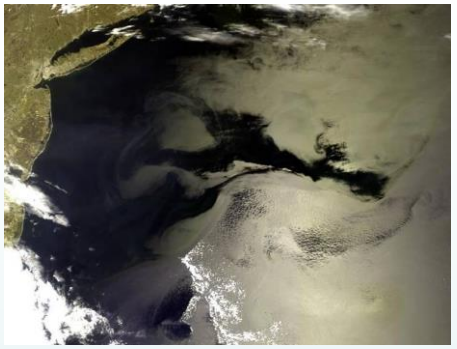
- an atmospheric correction procedure to retrieve water reflectances as an alternative to the standard AC
- a procedure to determine IOPs from water reflectances with conversion to concentrations
- both procedures are based on artificial neural networks, which are trained with simulated data

Retrieval of Rw from Rtoa (Atmospheric correction):

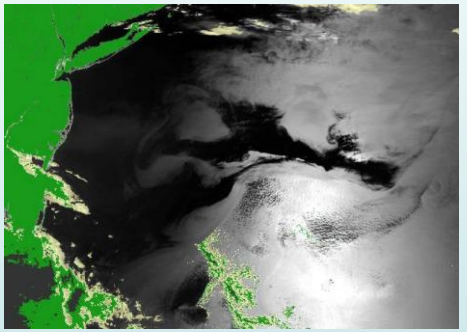
- 1) determine Rtosa from Rtoa by converting Rtoa to standard pressure and no gaseous absorption (ozone, H2O)
- 2) use of 3 neural networks, which are trained with simulated data
- - aaNN to check if Rtosa is within training range, set flag
- - NN Rtosa - > Rw, Rpath
- - NN Rtosa → aot550, angstrom
- Bands: **400**, 412, 443, 489, 510, 560, 665, **674**, 681, 709, 754, 779, 865, **1020**

Atmospheric correction

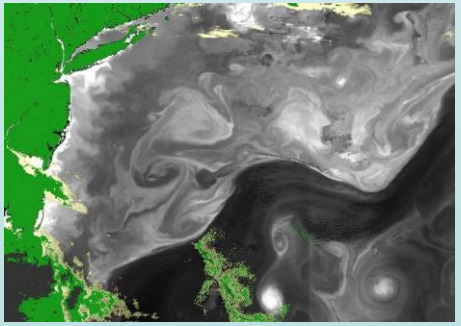




Rtoa 560 nm

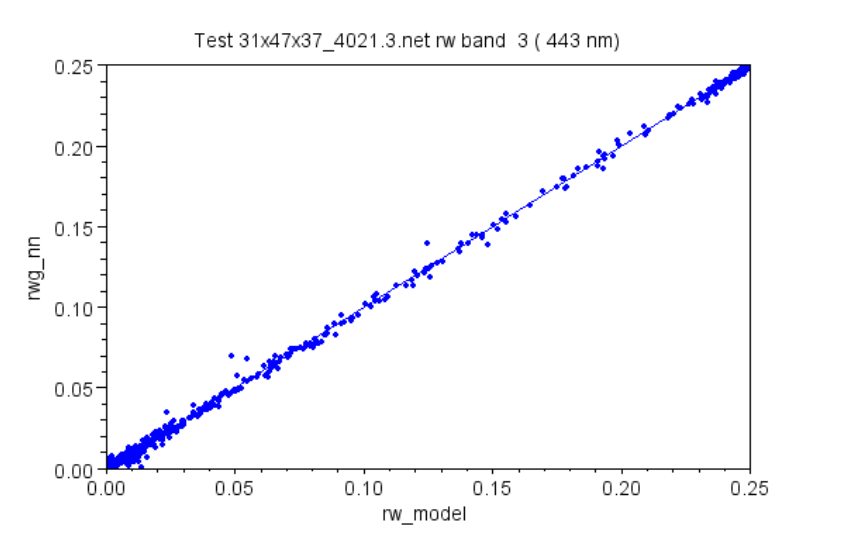


Rpath 560

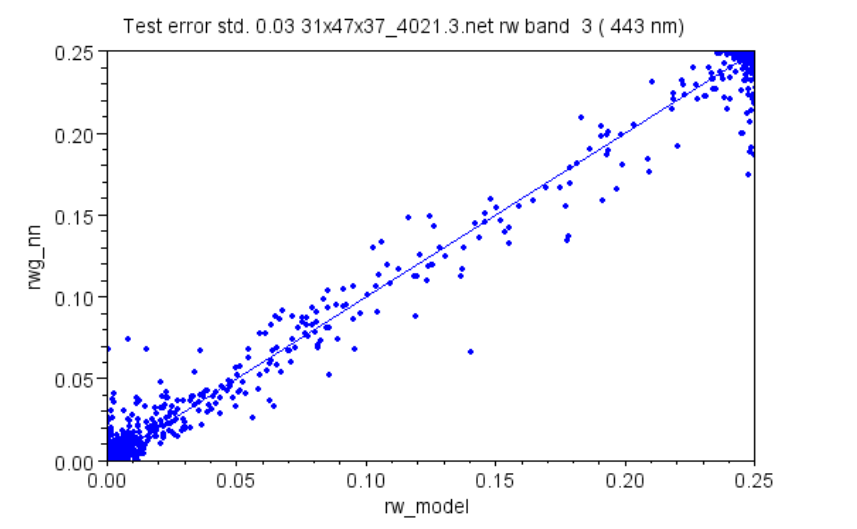


Rw 560

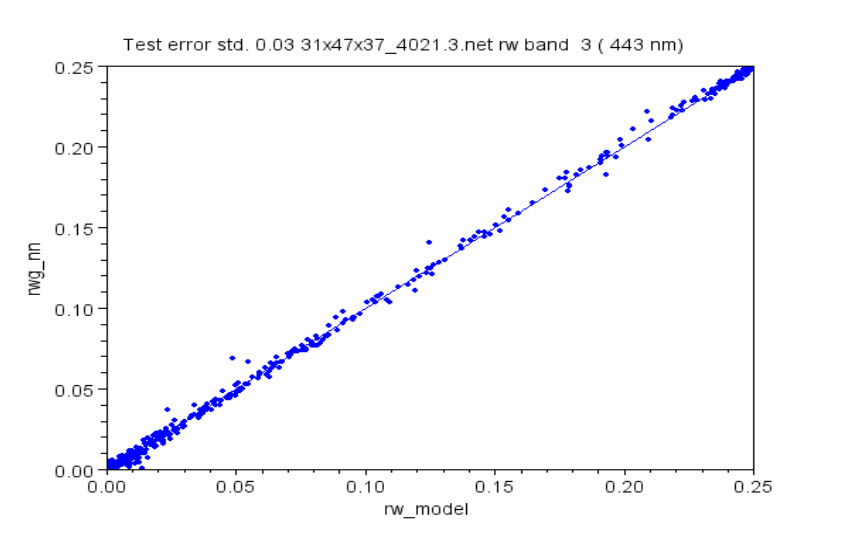
Test of NN for water reflectance of OLCI band 3 (443 nm)



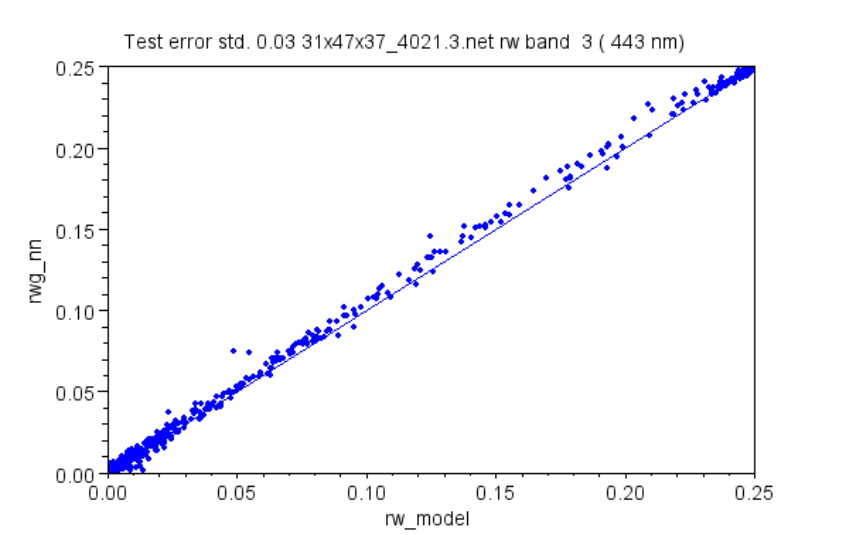
no additional error of Rtosa



3% random error of Rtosa



3% bias of Rtosa all bands

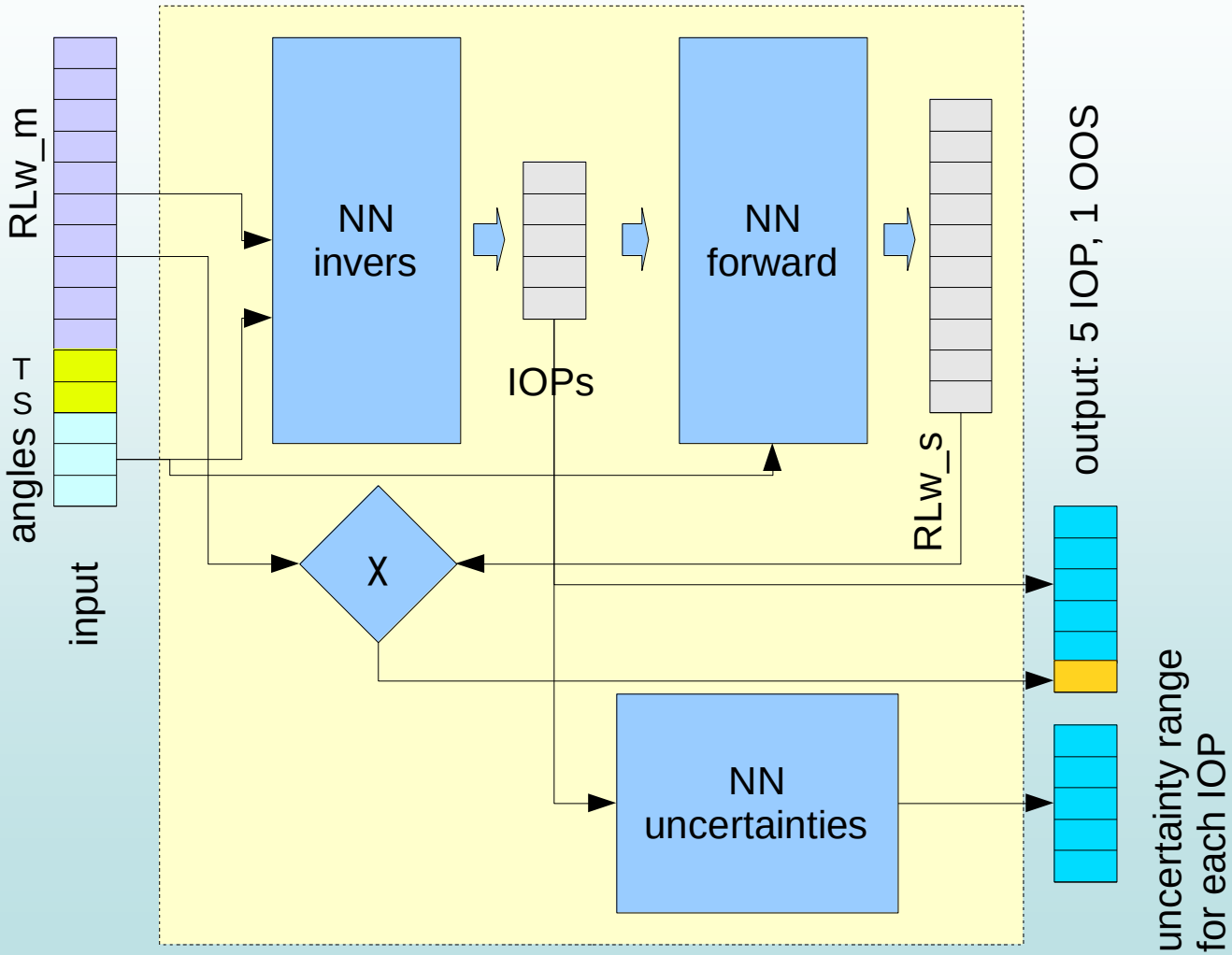


3% individual bias of Rtosa all bands

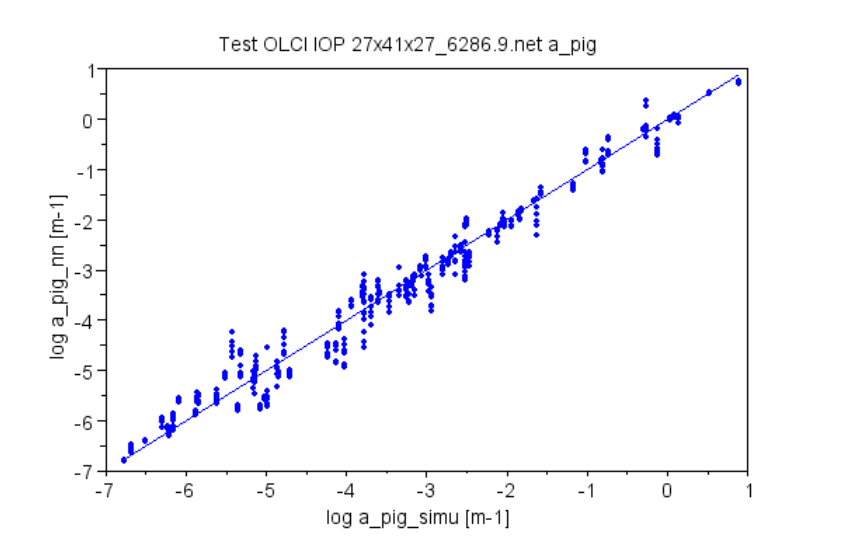
Retrieval of IOPs from Rw

- 1) determine 5 IOPs from Rw
- 2) simulate Rw' with forward NN from the 5 IOPs and compare with Rw for out of scope check, set flag
- 3) compute uncertainties of IOPs using the uncertainty NN
- 4) compute concentrations from IOPs using empirical relationships
- 5) IOPs:
- absorption by particulate organic matter / humic acids (exponent 0.008
- absorption by dissolved organic matter / fulvic acids (exp. 0.022)
- absorption by phytoplankton pigments
- scattering by total suspended matter (exp. 0.08)
- scattering by white particles

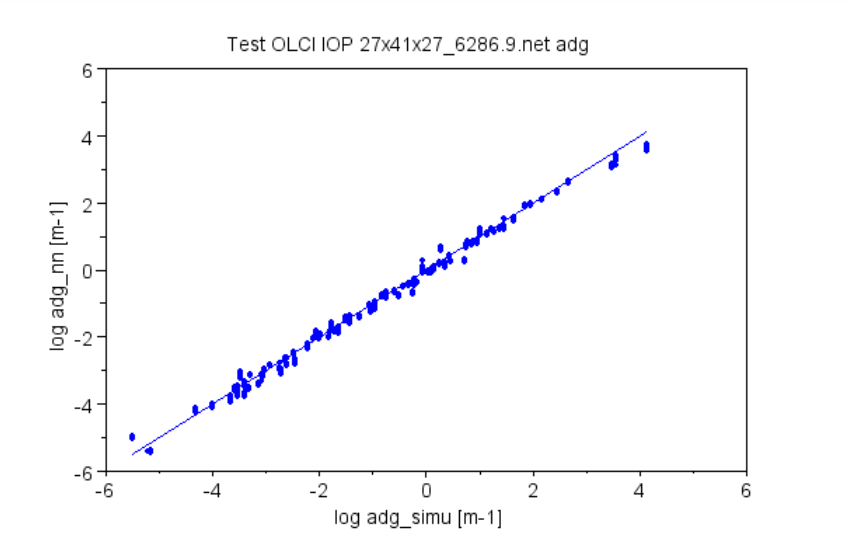
3 NNs to determine IOPs, check out of scope and determine uncertainties of IOPs



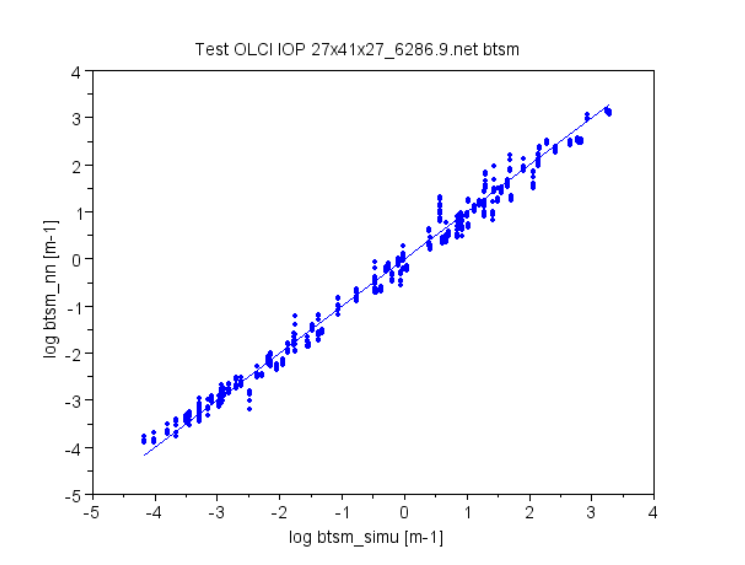
Test of NN for IOPs



Test of NN for a_pig

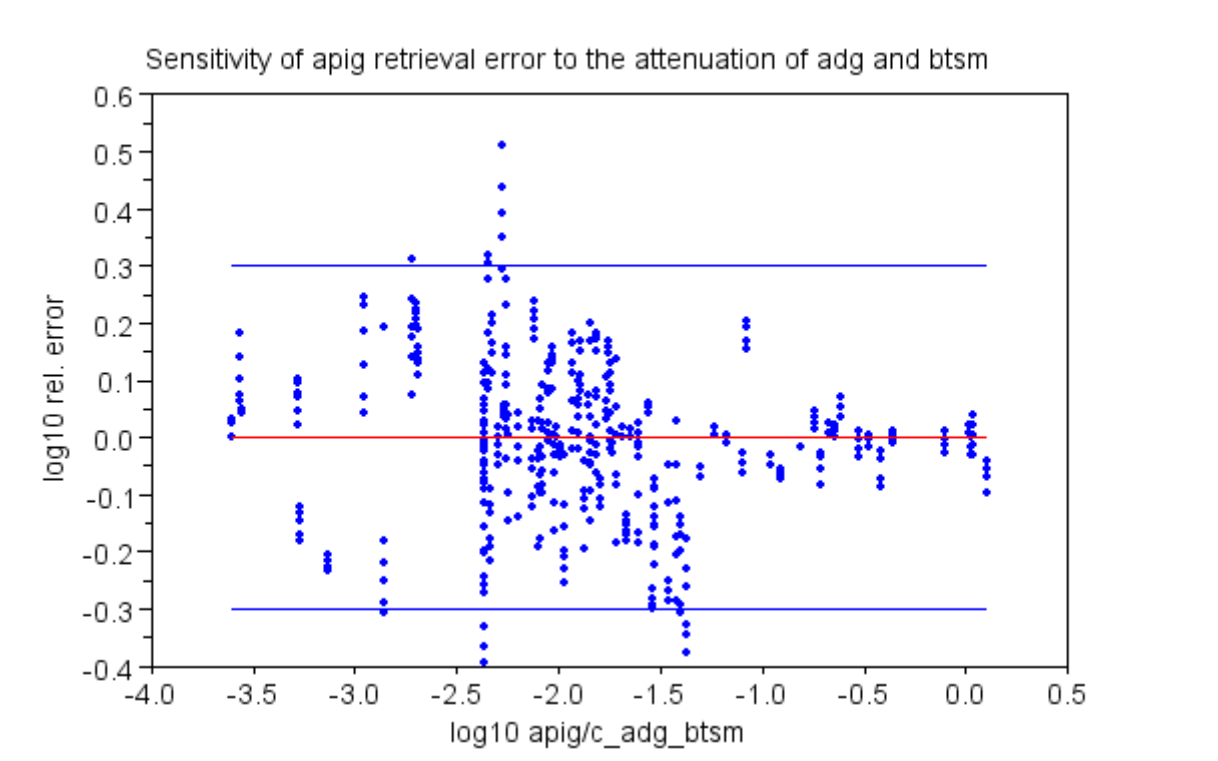


Test of NN for a_dg



Test of NN for b_tsm

Retrieval uncertainty for a_pig



Relative retrieval error as a function of the contribution of a_pig to the total attenuation of all 5 components.
Red line indicates no error, blue lines bracket the factor 2 error

Summary

- OLCI Case 2 water algorithm was designed as the heritage of the MERIS case 2
- 15 out of 21 bands of OLCI are use (3 more than for MERIS): includes 400 and 1020 nm bands
- A larger swath angle is considered (because of asymmetric view)
- Temperature and salinity effects
- User products are as for MERIS: TSM, Chl. Adg_443
- For each product the estimated uncertainty is provided
- Further internal variables are:
  - Path radiance and water reflectances
  - Separate IOPs: a_pig, ad, ag, bp, bw
  - Out of scope deviations from aaNN and forNN
- Final NNs will be based on Coastcolour results