On the role of VIS radiation for the ozone information retrieval from SCIAMACHY data by means of neural network algorithms

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esa Atmospheric Science Conference
European Space Agency

PURPOSE:

To investigate the possibility of improving the accuracy of Neural Network algorithms for the retrieval of ozone profiles and Tropospheric Ozone Columns by including VIS radiances into the NN input vector
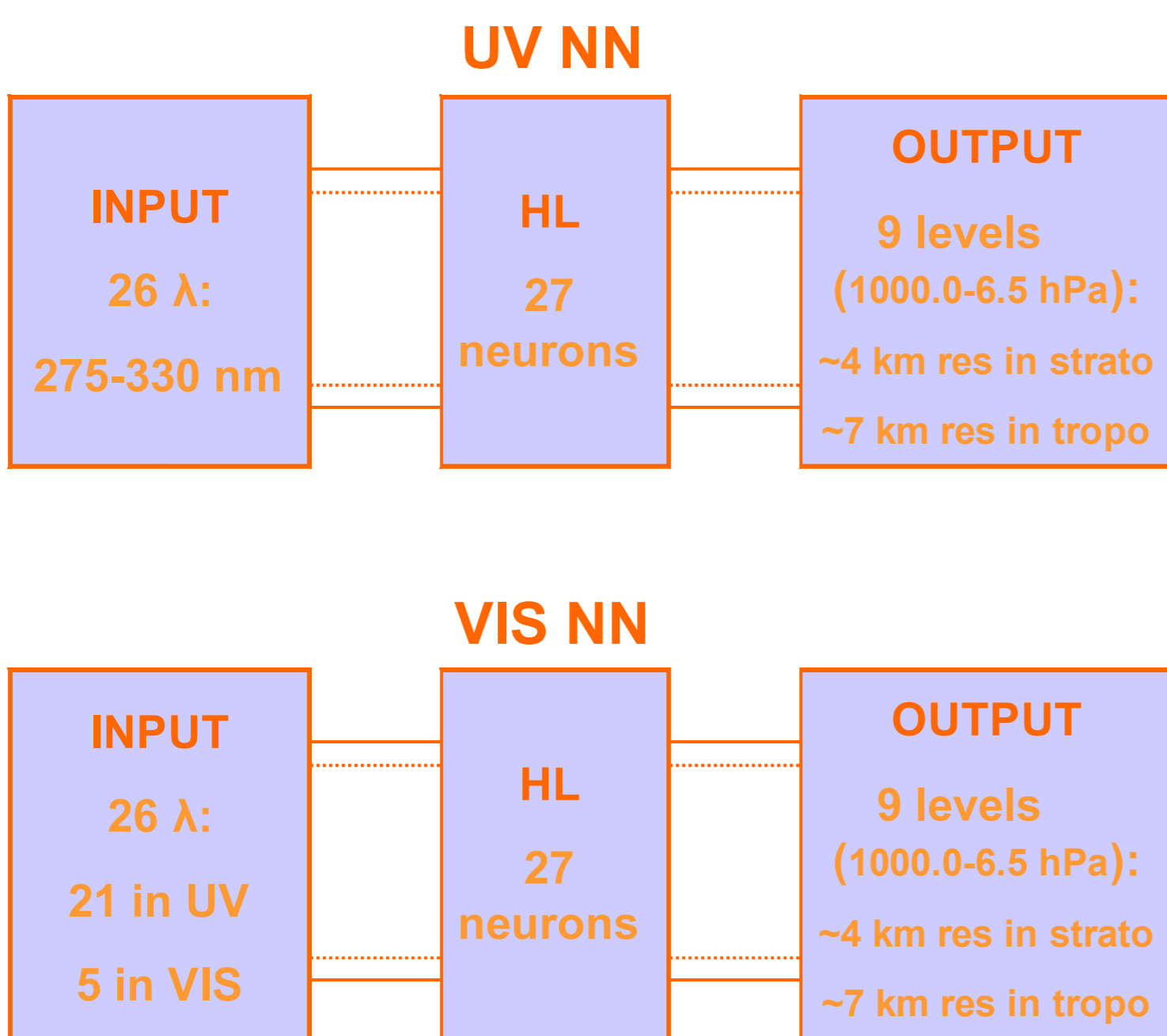
METHODOLOGY:

✓ Two retrieval problems:
 1. Ozone profile retrieval
 2. TOC retrieval
✓ For each retrieval
 1. Two NNs: one using UV, one considering UV/VIS
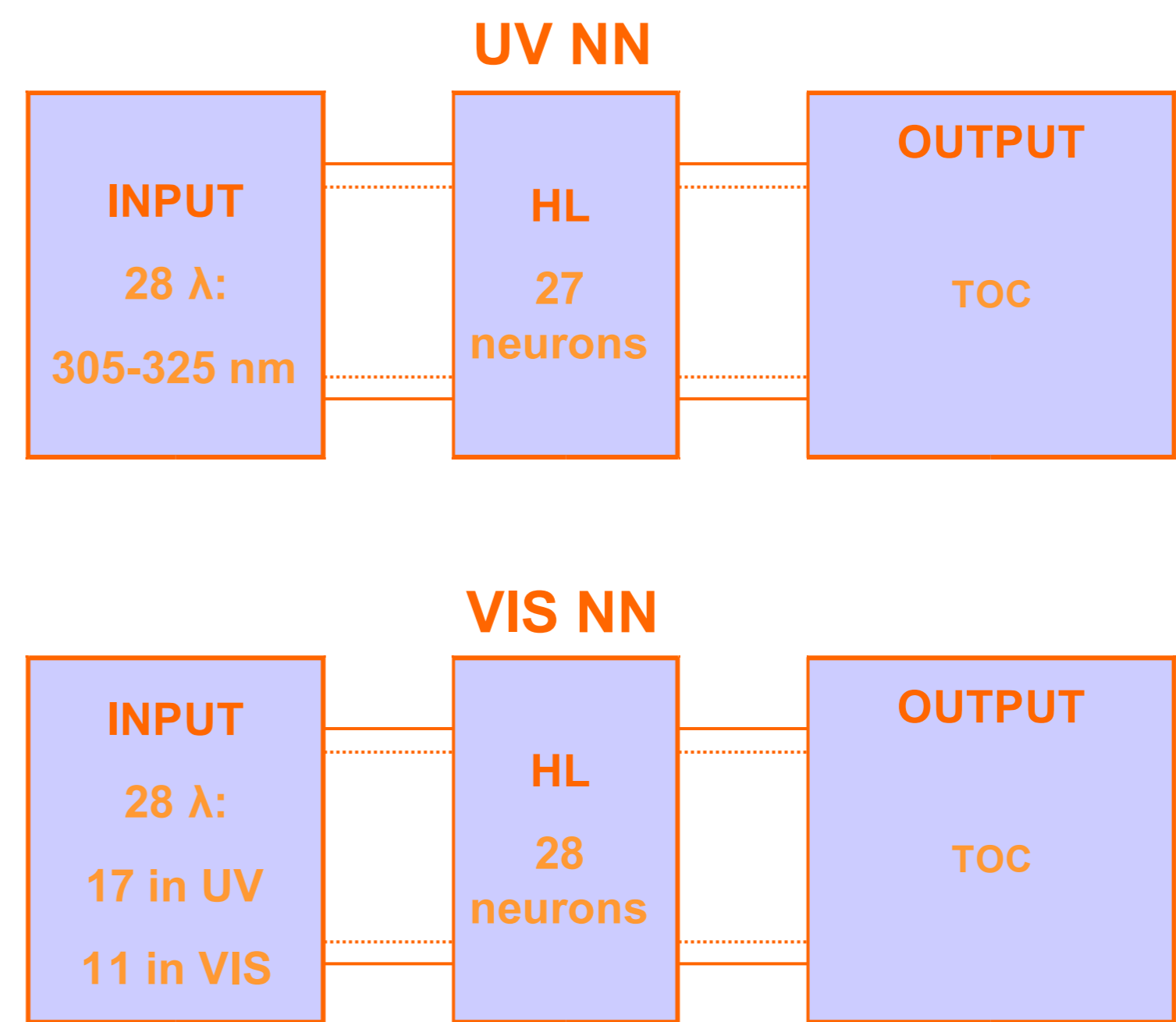 2. Tests against ozonesonde measurements for performance comparison

DESIGN OF THE NNs

✓ Input output pairs: nadir SCIAMACHY spectra - WOUDC/SHADOZ ozonesonde data
✓ Wavelength selection by Extended Pruning
✓ Empirical topology selection

NNs FOR OZONE PROFILE RETRIEVAL

UV NN

INPUT	HL	OUTPUT
26 λ:	27	9 levels
275-330 nm	neurons	(1000.0-6.5 hPa):
		~4 km res in strato
		~7 km res in tropo

VIS NN

INPUT	HL	OUTPUT
26 λ:	27	9 levels
21 in UV	neurons	(1000.0-6.5 hPa):
5 in VIS		~4 km res in strato
		~7 km res in tropo

NNs FOR TOC RETRIEVAL

UV NN

INPUT	HL	OUTPUT
28 λ:	27	TOC
305-325 nm	neurons	

VIS NN

INPUT	HL	OUTPUT
28 λ:	28	TOC
17 in UV	neurons	
11 in VIS		

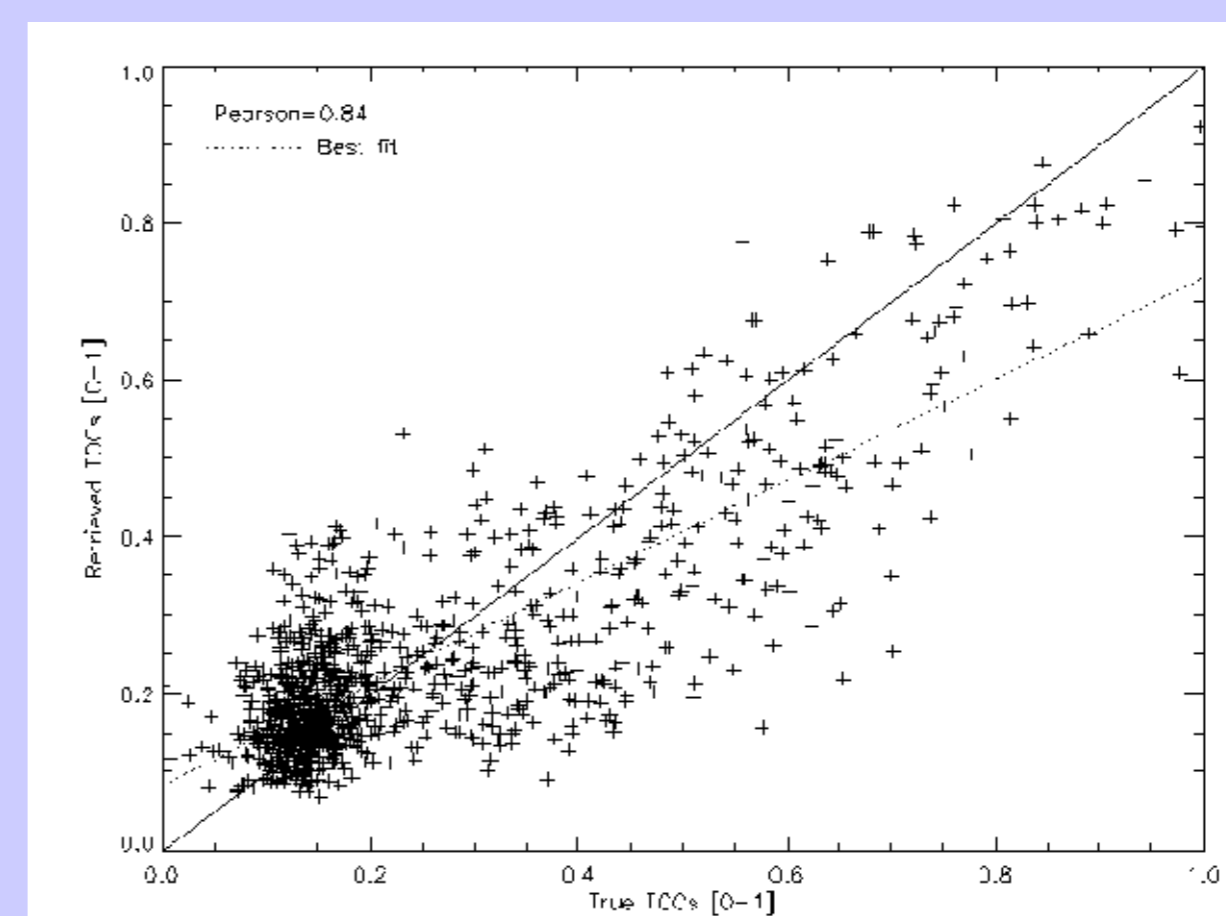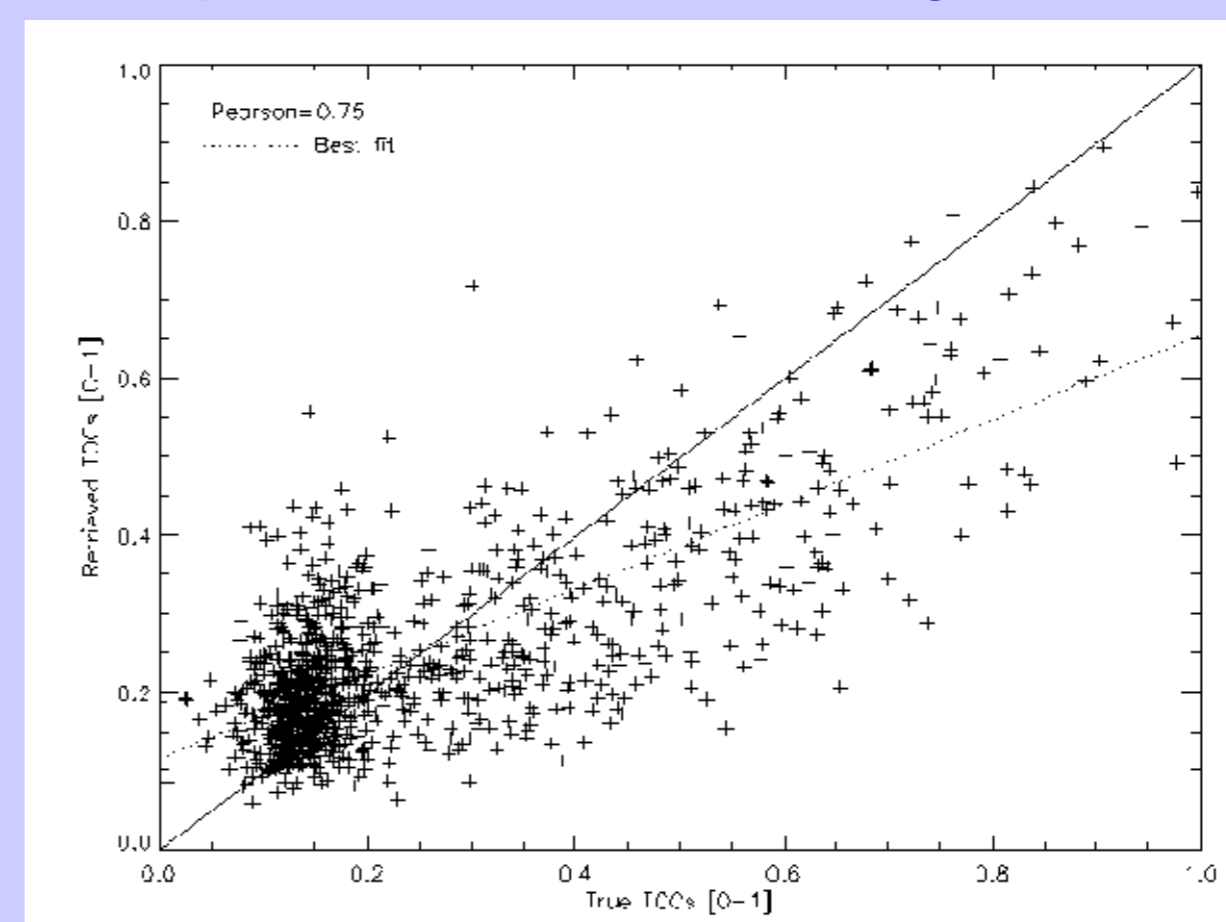## EXPERIMENTAL RESULTS: OZONE PROFILES

Correlation coefficient between true and retrieved profiles
✓ NN using VIS performs better
✓ Maximum enhancement in troposphere
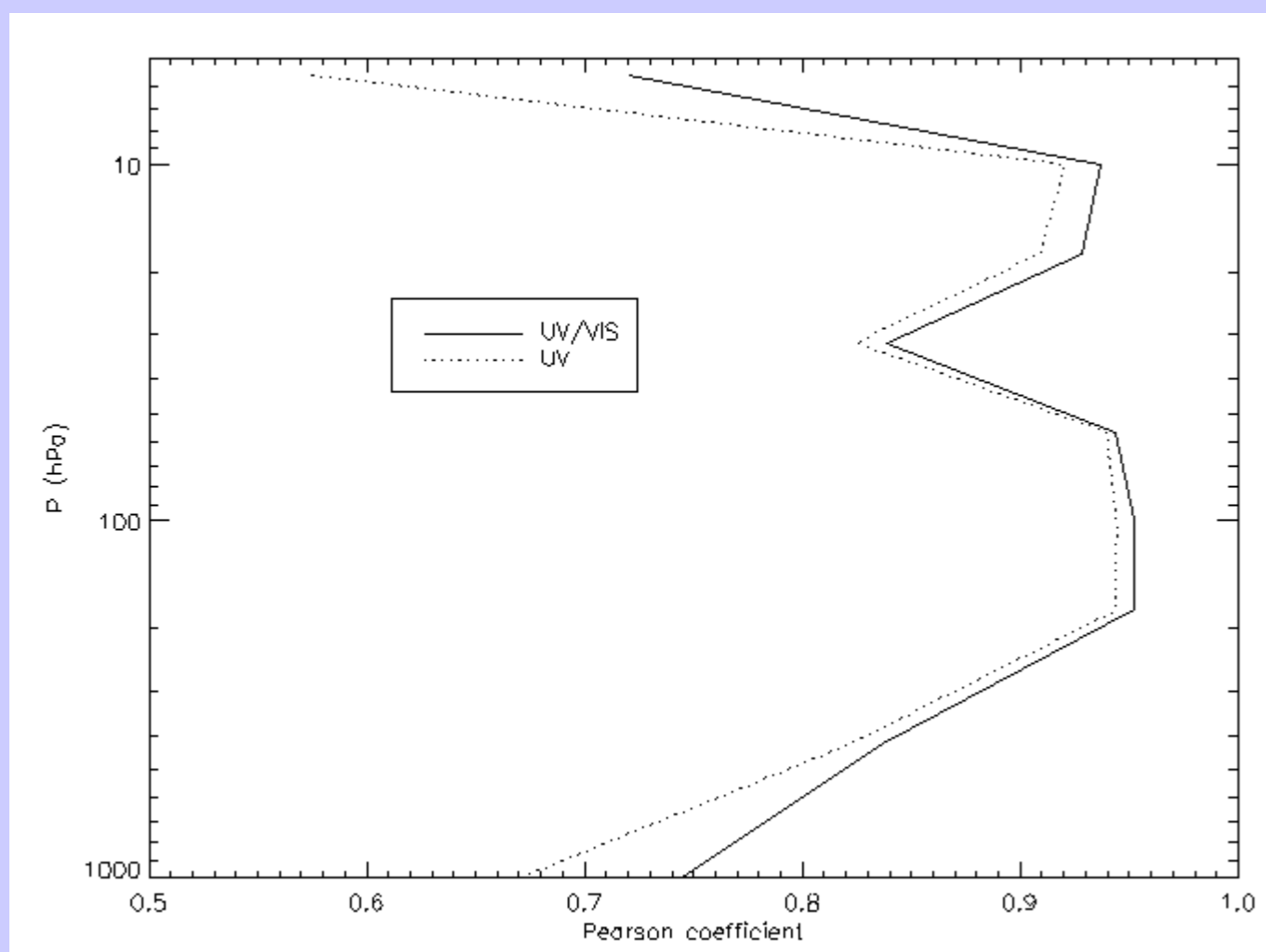
EXPERIMENTAL RESULTS: TOCs

Correlation coefficient between true and retrieved TOCs
✓ Considerable improvement in the NN using VIS

SOME INTERPRETATIONS

Physically reasonable results
✓VIS radiation carries information about ozone
✓Non negligible tropospheric contribution to VIS signal
Role of Neural Networks
✓OE retrieval schemes usually neglect VIS, due to difficult RT modeling
✓NNs exploit data to extract VIS information

CONCLUSION

**We investigated the possibility of enhancing the accuracy of NN ozone retrieval algorithms by using VIS radiation.
Tests on SCIAMACHY Level 1b data showed significant enhancement for tropospheric retrievals.**