



Neural Networks for Atmospheric Temperature Retrieval from AQUA AIRS/AMSU/HSB Measurements



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Dataset

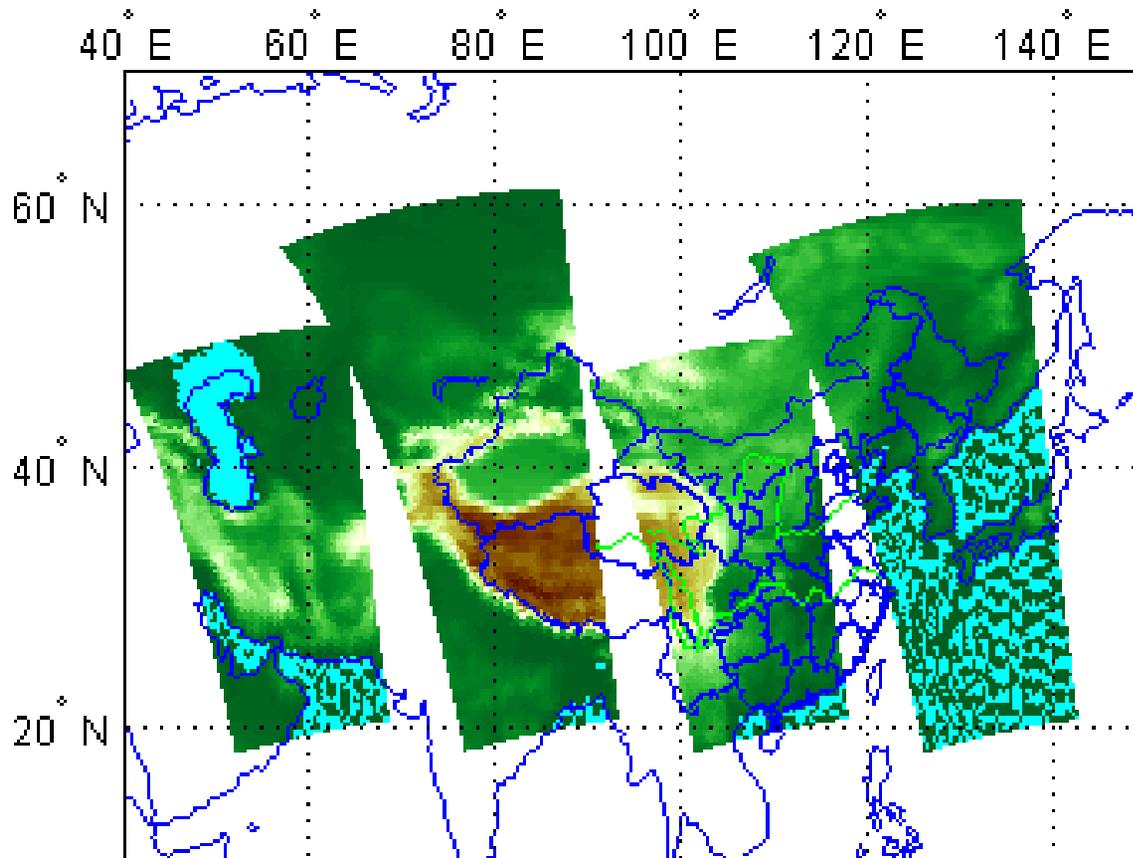


Figure 1

Dataset

Totally 11,658 cloud-free samples were derived from 10 granules which numbered as 043, 044, 045, 060, 061, 076, 077, 078, 093, 094, as shown in figure 1, within observation period 04:17am to 09:23am (UTC) on 6 September 2002. Co-located with ECMWF analysis fields at 06 (UTC). These cloud-free samples were arbitrarily clustered in two classes: (1) on complicated terrain (with Qinghai-Tibet and sea surface involved) located at latitude between 20°N and 40°N ; (2) on plain terrain located at latitude between 40°N and 60°N . And each class was divided up into two subsets for training and test, which were picked as equally spaced points throughout the original dataset.

Three-layered feed-forward neural networks ----Training and Retrieving

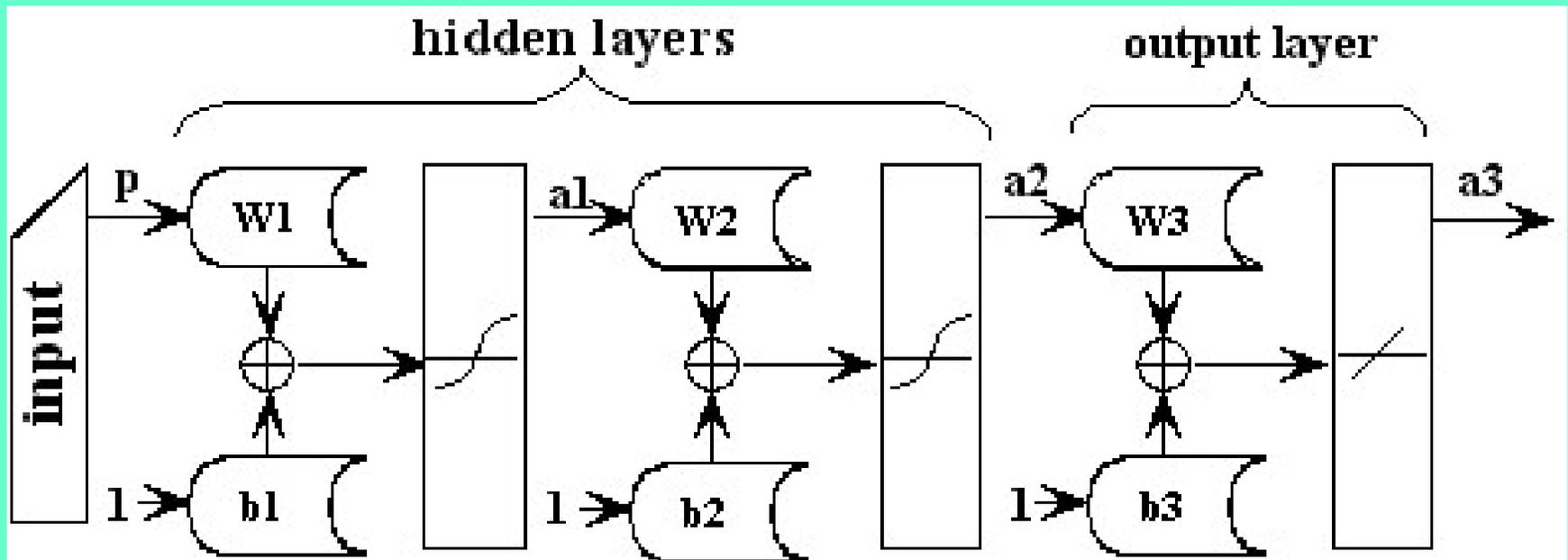


Figure 2. Neural networks structure
 $F(p) = w_3 F_2(w_2 F_1(w_1 p + b_1) + b_2) + b_3$

RESULTS: Total RMS Errors

Spectral coverage	20~40°N	40~60°N
L	1.0220	0.8122
M	0.9524	0.7635
S	1.0406	0.8519
L+M	0.9650	0.8191
L+S	0.9864	0.8299
M+S	0.9829	0.8107
L+M+S	0.9687	0.8080
AIRS+AMSU+HSB	0.9795	0.8074
Adding additional predictors	0.8990	0.7510

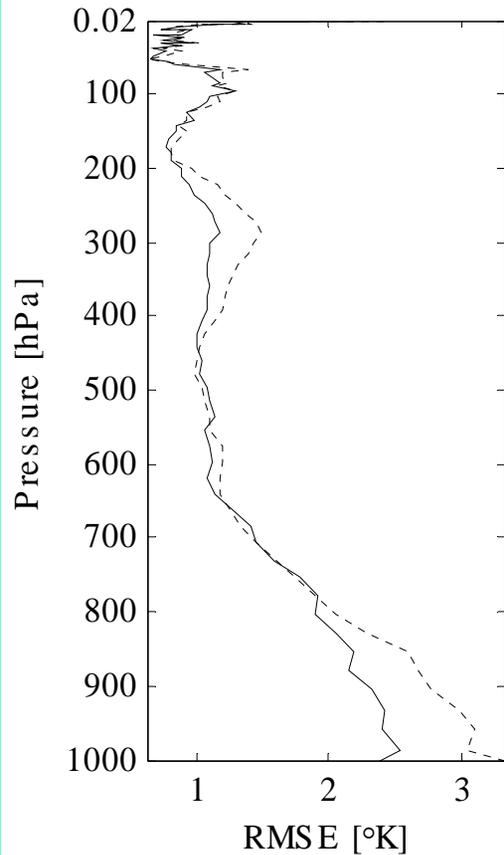


Fig. 3

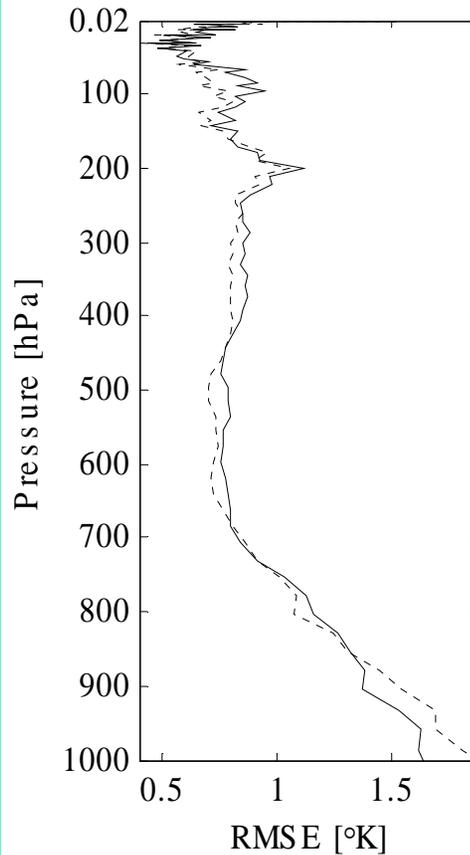


Fig. 4

Temperature retrieval
RMS errors on
complicated terrain and
on plain surface

- Figure 3 and figure 4 demonstrate RMS errors of temperature retrieval at latitude between 20~40°N and, and between 40~60°N and respectively. The dotted line represents the retrieved RMS temperature errors by using IR channels only (AIRS) and the solid is similar but with microwave channels (AMSU & HSB) merged in.
- In comparison with figure 3 and figure 4, we see that retrievals performance much better at flat terrain than at complicated surface and microwave channels help to improve accuracy in temperature retrievals at the near surface pressure levels at complicated terrain more obviously than at plain surface.

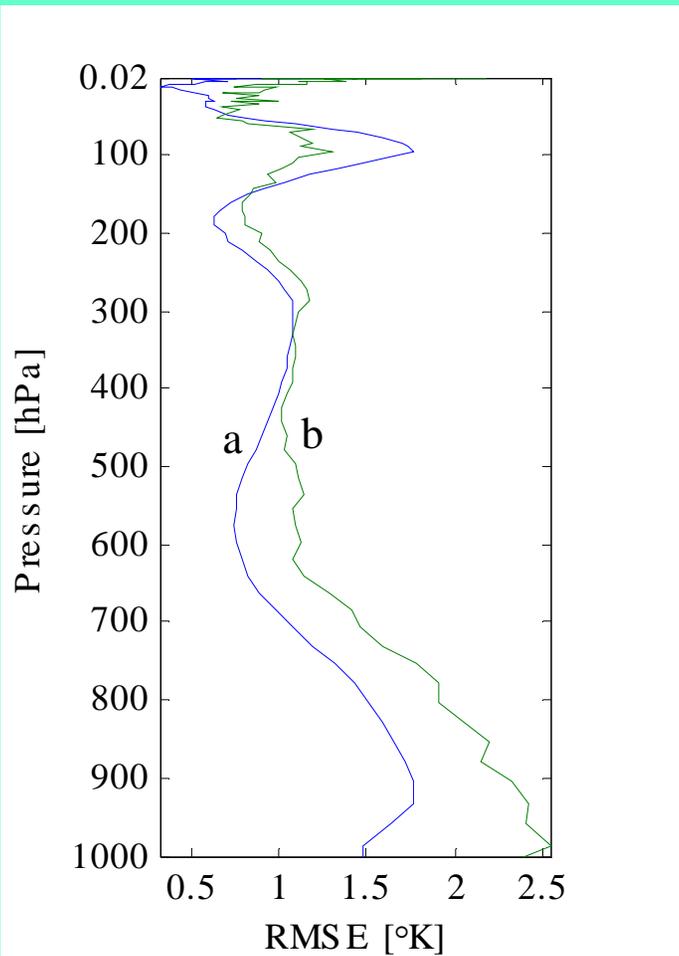


Fig. 5

- Line a (blue solid line) in fig. 5 indicates the RMS errors with the Plateau eliminated. It is similar to fig. 4 --- the RMS errors on flat terrain. This result shows that the Qinghai-Tibet Plateau plays an important roll in the retrieval that should be particularly considered.



THANKS