Current Near surface Humidity and Air Temperature Algorithms

February 2013

The current near-surface (10 m)specific humidity retrieval using AMSU-A and SSM/I or SSMIS observations is

$Qa = 1190.54 + 0.0200904 \times (Tb\_52.8)^2$

$+ 0.238133 \times Tb\_19v$

$- 9.76803 \times Tb\_52.8$

$- 0.310587 \times Tb\_37v$

$+ 0.105427 \times Tb\_22v$

The stability correction for observations north of $30^oN$

$\Delta Qa = 5.64426 – 0.284124 \times (SST-Tb\_52.8) +0.435181 \times Qa$

So the corrected Qa for retrievals north of $30^oN$ is

$Qa\_corrected = Qa + \Delta Qa$

The current near-surface (10m) air temperature retrieval using AMSU-A, SSM/I or SSMIS observations is

$Ta = -244.853 + 0.459832 \times Tb\_52.8$

$+ 0.0637408 \times Tb\_22v$

$- 0.428275 \times Tb\_37v$

$+ 0.385274 \times Tb\_19v$

$+ 0.573154 \times Tb\_53.6$

The stability correction for observations north of $30^oN$

$\Delta Ta = 19.0637 – 0.699539 \times (SST-Tb\_52.8) + 0.259892 \times Ta$

So the stability-corrected Ta for retrievals north of $30^oN$ is

$Ta\_corr = Ta + \Delta Ta$

A second Ta correction based Ts-Ta differences between coincident ship and satellite observations is

$$TsTa\_adjust = 0.473544 + 0.322480 \times (Ts - Ta\_corr) + 0.0238934 \times (Ts - Ta\_corr)^2 + 0.000614320 \times (Ts - Ta\_corr)^3$$

The resulting Ta data using this final correction is

$$Ta\_final = Ts - TsTa\_adjust$$

Description of parameters:

Tb_52.8 = AMSU-A 52.8 GHz brightness temperature (K)

Tb_53.6 = AMSU-A 53.8 GHz brightness temperature (K)

Tb_19v = SSM/I or SSMIS 19V GHz brightness temperature (K)

Tb_22v = SSM/I or SSMIS 22V GHz brightness temperature (K)

Tb_37v = SSM/I or SSMIS 37V GHz brightness temperature (K)

Ts = Sea surface temperature (Celsius)

Ta (and all its two corrections) = 10m air temperature (Celsius)

Qa (and its correction) = 10m specific humidity (g/kg)