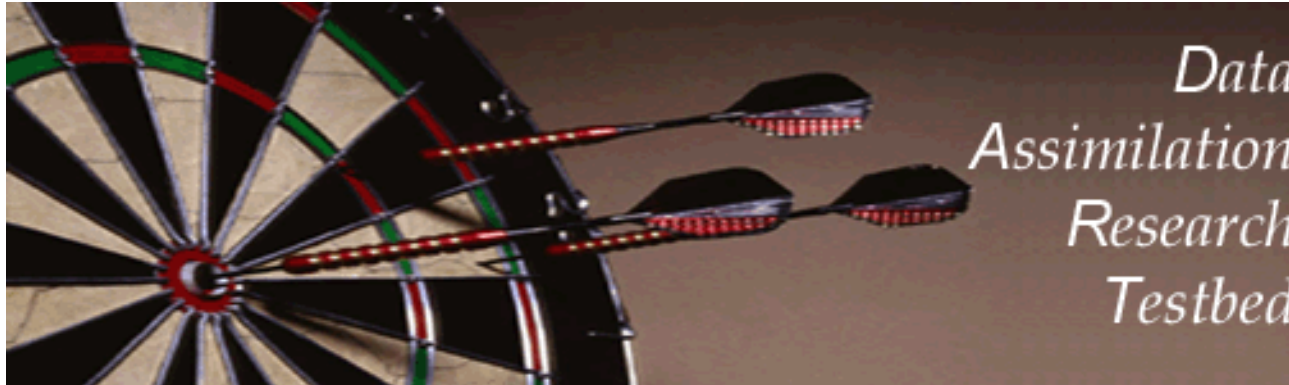


# Data Assimilation Research Testbed Tutorial



## Section 14: DART Observation Quality Control

Version 2.0: September, 2006

## Quality control summary

*obs\_seq.in* files can have a prior quality control value

For instance, BUFR files from NCEP contain a prior qc value

The DART quality control value has metadata *DART quality control*

*obs\_seq.final* generated by filter has following DART qc values:

0. Assimilated
1. Evaluated only
2. Assimilated but posterior forward observation operator(s) failed
3. Evaluated only but posterior forward observation operator(s) failed
4. Not used, prior forward observation operator(s) failed
5. Not used because not selected in *obs\_kind\_nml*
6. Not used, failed prior quality control check
7. Not used, violated outlier threshold

## Quality control details:

DART qc values 0 to 3 indicate that the observation was okay

0 and 2: observation was assimilated

Obs. kind is *assimilate\_these\_obs\_types* in *obs\_kind\_nml*

1 and 3: Prior observation ensemble computed, not assimilated

Obs. kind is *evaluate\_these\_obs\_types* in *obs\_kind\_nml*

This is withholding an observation to be used for validation

2 and 3: one or more posterior forward operators failed

Cannot use this observation for posterior diagnostics

Can be used for prior diagnostics

DART qc value 5 indicates observation not used at all.

Not listed in *obs\_kind\_nml*.

Not used in either prior or posterior diagnostics.

## Quality control details:

DART qc value 6 indicates that the prior qc value was too large.

Threshold is set by *input\_qc\_threshold* in *filter\_nml*.

If qc of observation is greater than threshold, then...

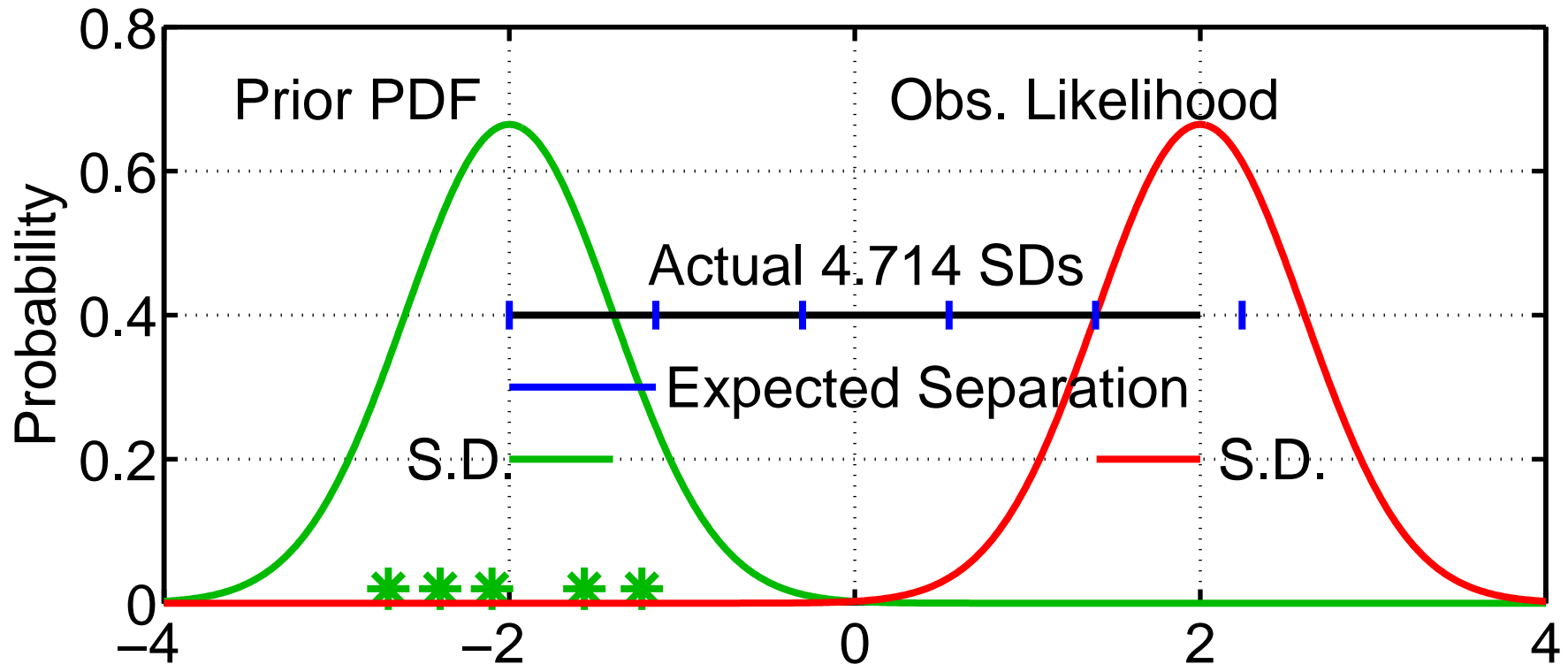
Observation is not assimilated.

Not used in either prior or posterior diagnostics.

**NOTE:** BUFR qc values larger than 3 means observation is suspect.

## Quality control details:

DART qc value 7 indicates outlier threshold exceeded



Expected(prior mean - observation) =  $\sqrt{\sigma_{prior}^2 + \sigma_{obs}^2}$

Reject if (prior\_mean - observation) > T times expected value.

T is set by *outlier\_threshold* in *filter\_nml*.

*outlier\_threshold* < 0 means no outlier check.

## Outlier threshold quality control

Designed to discard observations that are inconsistent with prior.

Setup a successful `lorenz_96` or `lorenz_63` assimilation case.

Setting *outlier\_threshold* to 2.0, or 1.5.

Examine what happens to assimilation quality.

Outlier threshold qc is essential when using BUFR observations.