Effect of statistical analysis parameters

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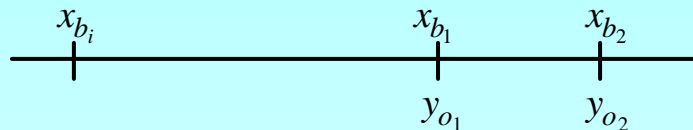
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Effect of statistical analysis parameters: Definitions

- Optimal interpolation:

$$\mathbf{x}_a = \mathbf{x}_b + \mathbf{BH}(\mathbf{HBH}^T + \mathbf{R})^{-1}(\mathbf{y}_o - \mathbf{Hx}_b)$$

$$?_{ij} = s_b^2 m_{b_{ij}} \qquad m_{b_{ij}} = (1 + r_{b_{ij}}/L_b)\exp(-r_{b_{ij}}/L_b)$$

$$\mathbf{R}_{ij} = s_y^2 m_{y_{ij}} \qquad m_{y_{ij}} = (1 + r_{y_{ij}}/L_y)\exp(-r_{y_{ij}}/L_y)$$

H is a simple interpolation operator

$$x_{a_i} = x_{b_i} + W[\mu_{b_{i1}}((y_{o_1}\text{-}x_{b_1})\text{-}C(y_{o_2}\text{-}x_{b_2})) + \mu_{b_{i2}}((y_{o_2}\text{-}x_{b_2})\text{-}C(y_{o_1}\text{-}x_{b_1}))]$$

$$C = \frac{(s_b^2 \mu_{b_{12}} + s_y^2 \mu_{y_{12}})}{(s_b^2 + s_y^2)} \qquad W = \frac{s_b^2}{s_b^2 + s_y^2}(1 - C^2)^{-1}$$

Effect of statistical analysis parameters: Example

- ANALYSIS_2OBS

Constructs 1-D analysis from 2 idealised obs with specified values and error characteristics

You may change the analysis parameters at the prompt, or press ENTER to retain previous values

- Current value o1 of ob#1   1.00000
- New o1 (between -2 and +2):
- Current position x1 of ob#1   4.00000
- New x1 (between 0 and 10):
- Current value o2 of ob#2   -1.00000
- New o2 (between -2 and +2):
- Current position x2 of ob#2   6.00000
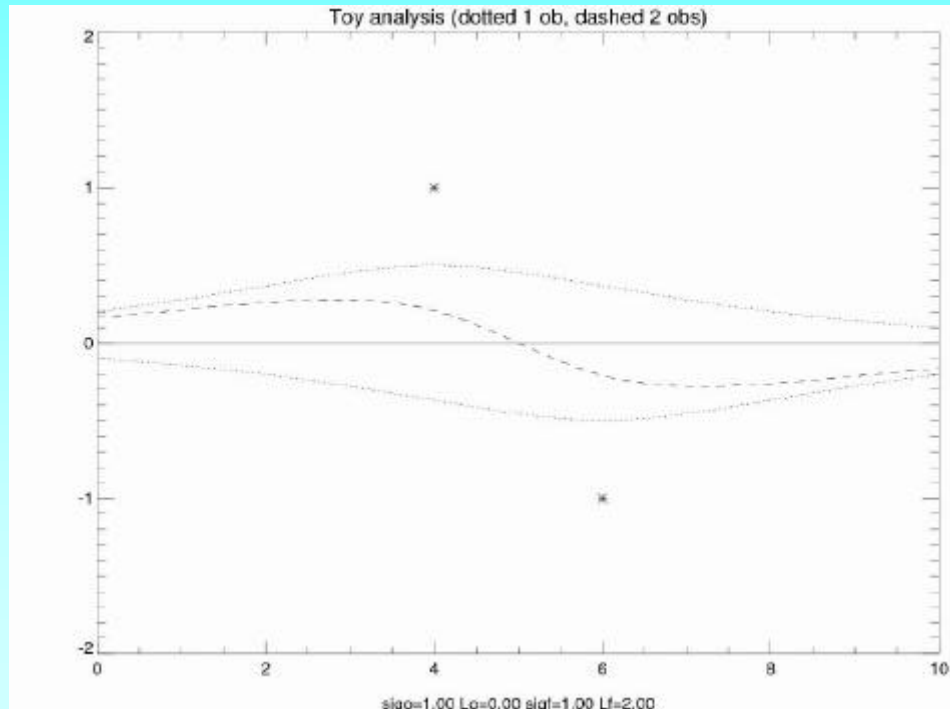- New x2 (between 0 and 10):

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Effect of statistical analysis parameters: Example

- Observation error σ_y (used for both obs)   1.00000
- New σ_y:

The observation error correlation depends on the distance between obs

- Current observation error correlation length L_y: 0.00000
- New L_y (put L_y = 0.0 for uncorrelated errors):
- Background error σ_b (constant)   1.00000
- New σ_b:
- Background error correlation length L_b 2.00000
- New L_b (put L_b = 0.0 for uncorrelated errors):

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Effect of statistical analysis parameters: Example

Toy analysis (dotted 1 ob, dashed 2 obs)

sigo=1.00 Lo=0.00 sigf=1.00 Lf=2.00

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Effect of statistical analysis parameters: Example

- ANALYSIS_MOBS

Constructs 1-D analysis from multiple idealised obs with specified values and error characteristics

- In this programme, we use two different ob types (A and B).
- The number of obs of each type should be in range 0 to 7.
- Press ENTER to retain previous values

- You may specify two separate observation types (A and B)
- Different observation types have different error characteristics

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Effect of statistical analysis parameters: Example

- TYPE-A OBSERVATIONS
- Number of type A obs, noa: 3
- New noa (up to 7; 0 if none):
- Current type A ob locations   5.00000   4.00000 6.00000
- Current type A ob values   1.00000   1.00000   1.00000
- Do you want to change them (y or n)? n
- New type-A ob locations   5.00000   4.00000   6.00000
- New type-A ob values   1.00000   1.00000   1.00000
- Observation error for type A, σ_{yA} :   2.00000
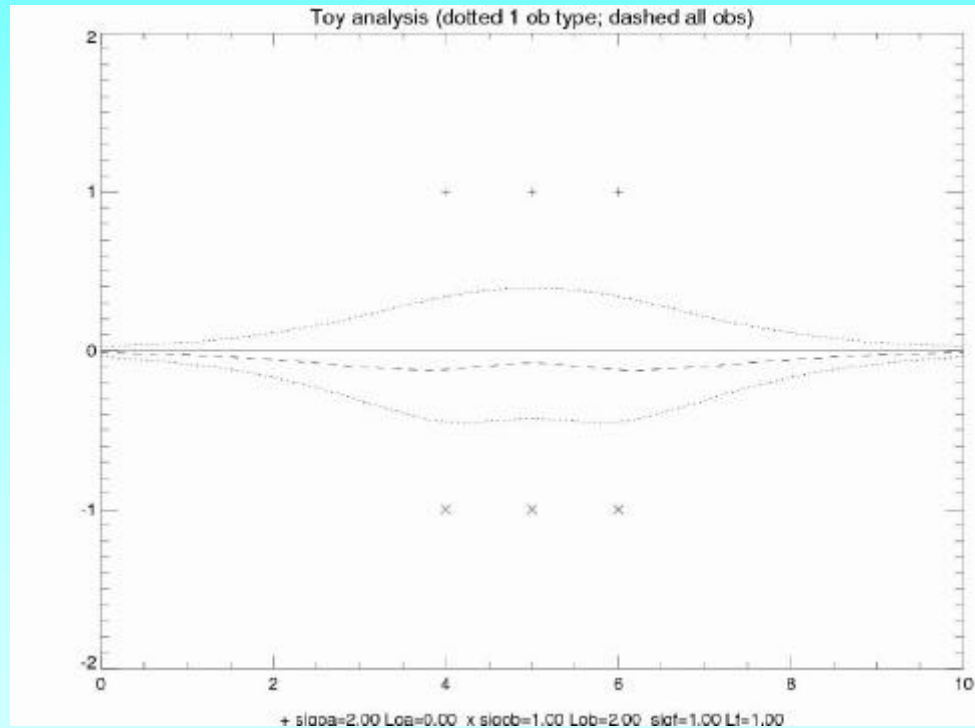- Observation error correlation length L_{yA}:   0.00000

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Effect of statistical analysis parameters: Example

-
- Number of type B obs, nob: 3
- New nob (up to 7; 0 if none):
- Current type-B ob locations   5.00000   6.00000 4.00000
- Current type-B ob values   -1.00000   -1.00000   -1.00000
- Do you want to change them (y or n)? n
- New type-B ob locations   5.00000   6.00000   4.00000
- New type-B ob values   -1.00000   -1.00000   -1.00000
- Observation error for type B, σ_{yB} 1.00000
- Observation error correlation length L_{yB} 2.00000
- BACKGROUND ("FORECAST") ERROR STATISTICS
- Background error σ_b (constant)   1.00000

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Effect of statistical analysis parameters: Example

Toy analysis (dotted 1 ob type; dashed all obs)

+ sigpa=2.00 Loa=0.00 x sigob=1.00 Lob=2.00 sigf=1.00 L1=1.00

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Effect of statistical analysis parameters: Example

• ANALYSIS_SIM - Toy Analysis System

• Constructs 1-D analysis from simulated truth, forecast and observations with specified values and error characteristics

• You may change parameters, or just press ENTER to keep existing values

• The truth field is one of the following:

• 0 - zero everywhere

• 1 - pseudo step function

• 2 - sum of several sinusoidal curves

• 3 - statistically generated

• Current truth type: 0

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Effect of statistical analysis parameters: Example

• BACKGROUND FIELD

• You may use a background field that is shifted relative to the "truth"

• OR a background equal to truth + random perturbation

• Current amount of background shift (positive on left): 0.00000

•New shift:

•Current background error, σ_b: 2.00000

•New σ_b:

•Background error correlation length L_y 2.00000

•New L_y (put L_y = 0.0 for uncorrelated errors):

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Effect of statistical analysis parameters: Example

- OBSERVATIONS
- Number of obs, no: 5
- New no (up to 11):
- Current ob locations   5.00000   6.00000   4.00000
  7.00000   3.00000
- Do you want to change them (y or n)? n
- Current observation error, σ_y: 1.00000
- New σ_y:
- Observation error correlation length L_y: 0.00000
- New L_y (0.0 for uncorrelated errors):

Effect of statistical analysis parameters: Example

Toy analysis (solid truth; dotted fcst; dashed analysis)

sigo=1.00 Lo=0.00 sigf=2.00 Lf=2.00

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