Prospective Work on
Regridding of Remote Sensing Measurements

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Comparison of remote soundings:

✓ Homogenize respective meas. coordinates, e.g. units + vertical grid.

No problem for simple profile comparison, as simple profile interpolation would do the job…

But: problem when taking AKs + a-priori information into account! (cf. Rodgers and Connor, JGR 2003)

➔ Method to convert also auxiliary retrieval products AKs, etc.

Idea (Trivial!)

$\overline{\mathbf{x}}$: Retrieved profile on a given vertical grid

$$\mathbf{y} - \mathbf{y}_0 = \mathbf{K}(\mathbf{x} - \mathbf{x}_0) + \boldsymbol{\varepsilon}_y$$

$\overline{\mathbf{x}}$: Retrieved profile on another vertical grid

$$\mathbf{y} - \mathbf{y}_0 = \overline{\mathbf{K}}(\overline{\mathbf{x}} - \overline{\mathbf{x}}_0) + \boldsymbol{\varepsilon}_y$$

➜ It exists **W** such as

$$\overline{\mathbf{x}} - \overline{\mathbf{x}}_0 = \mathbf{W}(\mathbf{x} - \mathbf{x}_0) \quad \text{or} \quad \overline{\mathbf{x}} = \mathbf{W}\mathbf{x}$$

And

$$\mathbf{x} - \mathbf{x}_0 = \mathbf{W}^*(\overline{\mathbf{x}} - \overline{\mathbf{x}}_0) \quad \text{or} \quad \mathbf{x} = \mathbf{W}^*\overline{\mathbf{x}}$$

$\mathbf{W}^*$: Pseudo-inverse of **W**

Consequently:

$$A \approx W^* \overline{A} W$$

Or

$$\overline{A} \approx W A W^*$$
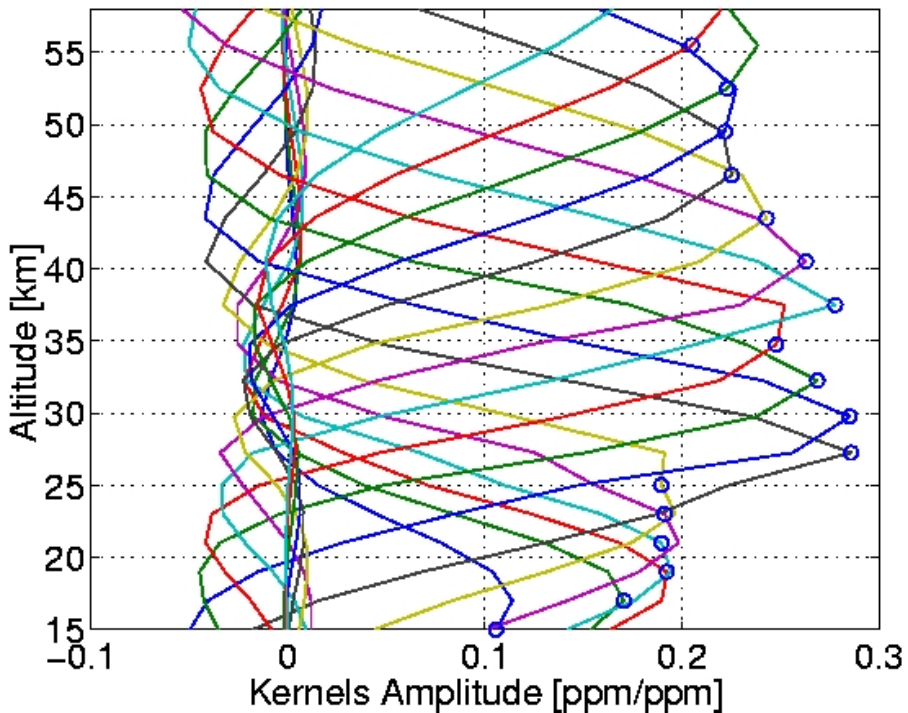
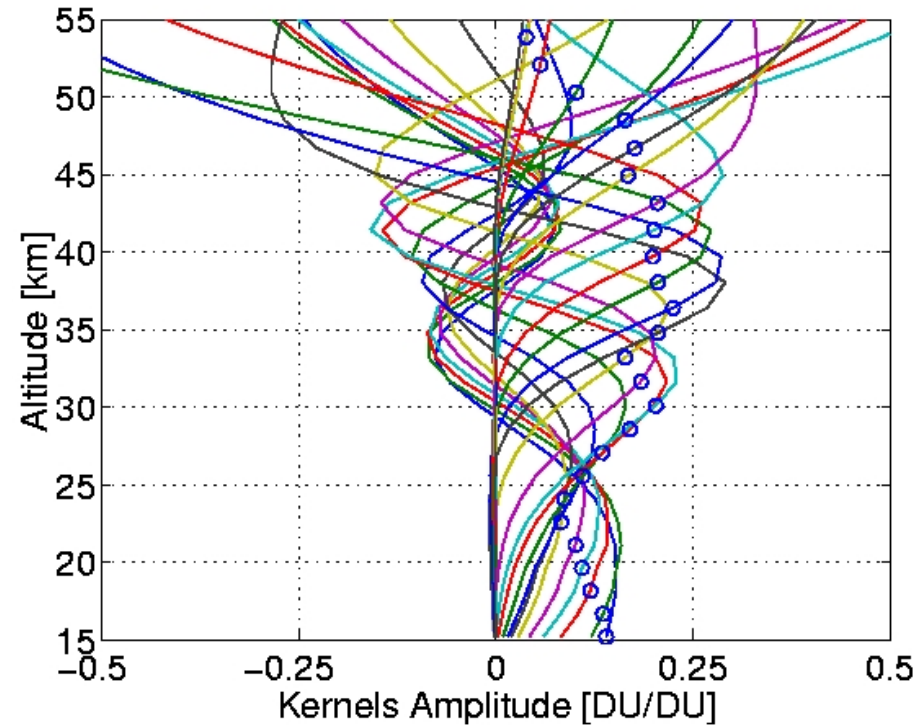Similarly:

$$\overline{S}_x \approx W S_x W^\mathsf{T}$$

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Application:
GOME – SOMORA O_3 Profile Comparison
(Cf. Rodgers and Connor, 2003)

SOMORA AKs

GOME AKs

Comparison procedure:

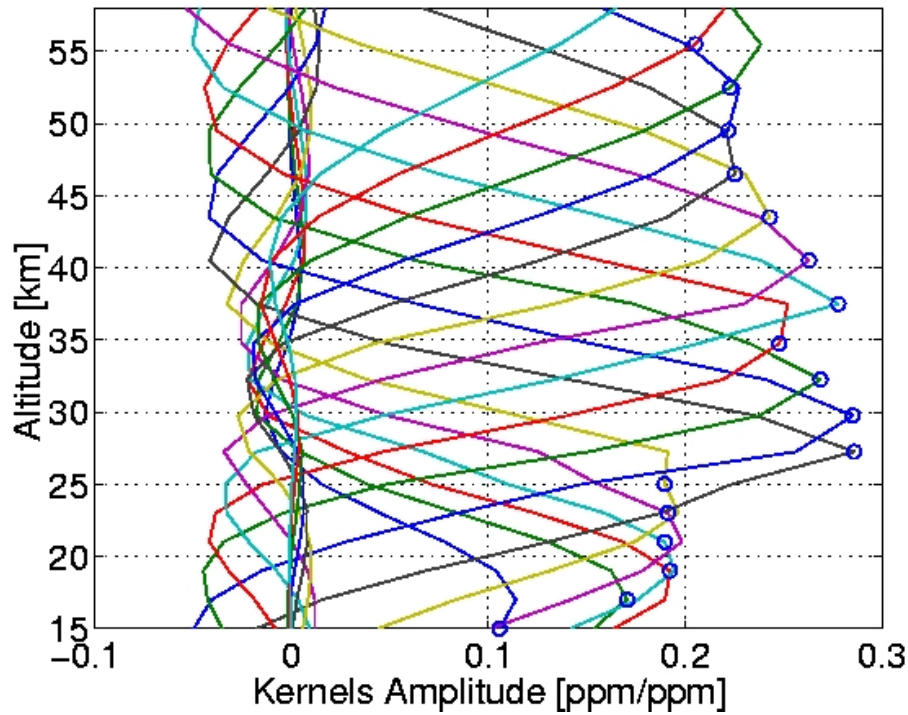

GOME Grid	SOMORA Grid	Verification Ensemble
GOME profiles	GOME profiles	GOME profiles
	W "Forward Model"	
	$W^{\dagger}$ "Inverse Model"	
SOMORA profiles	SOMORA profiles	SOMORA profiles
Sec. 4.2	Sec. 4.1	Sec. 4.3
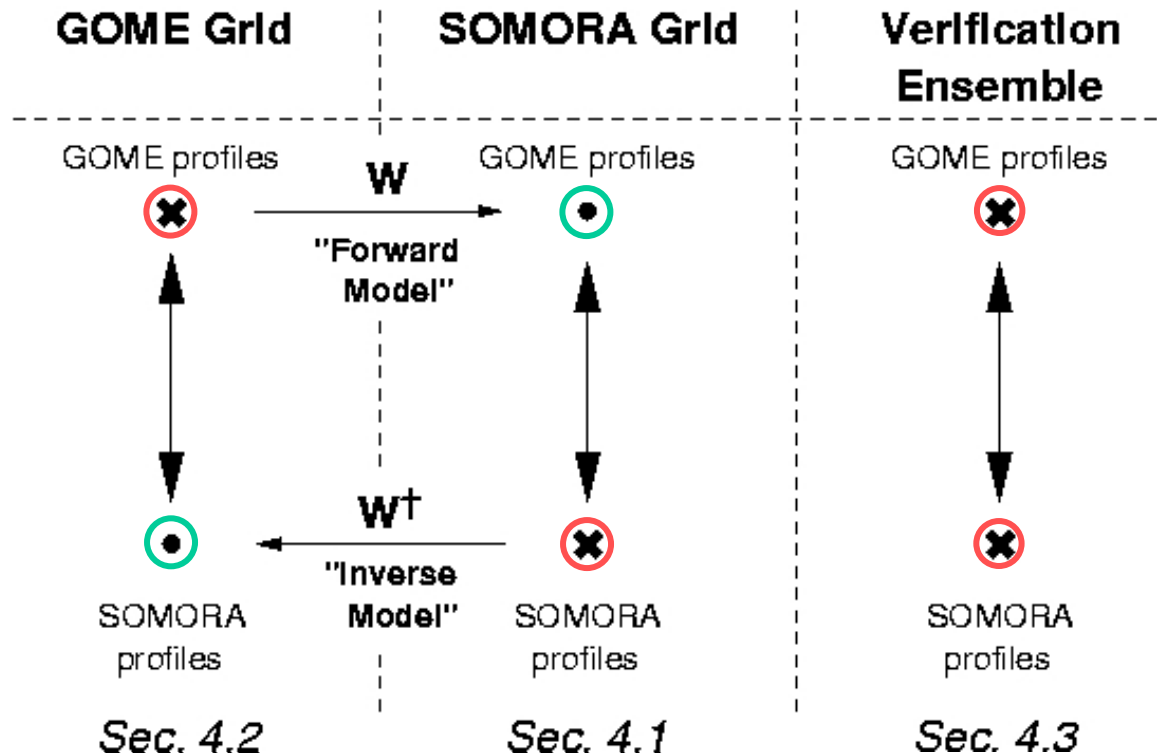
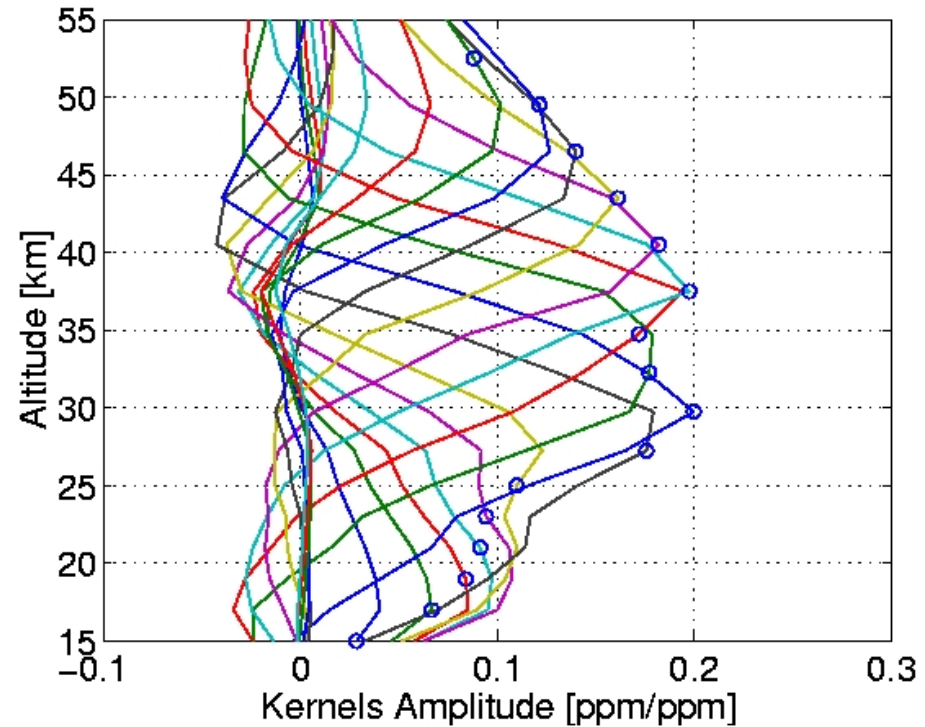○ : original datasets (respective vertic. grids and units)
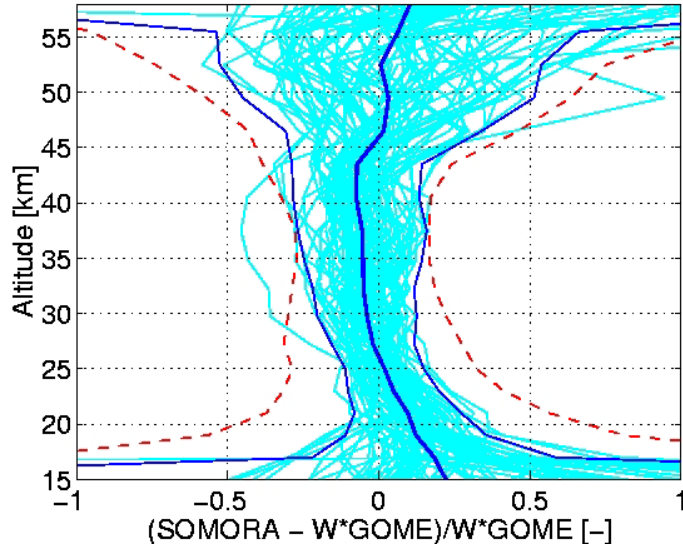○ : transformed datasets (grids and units)

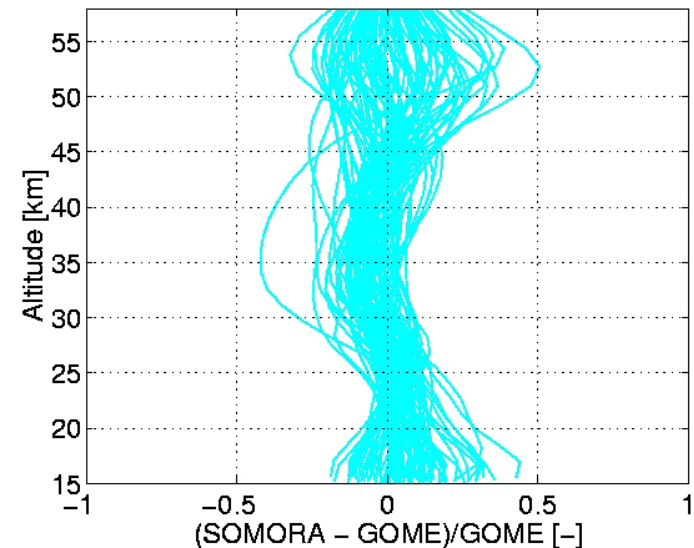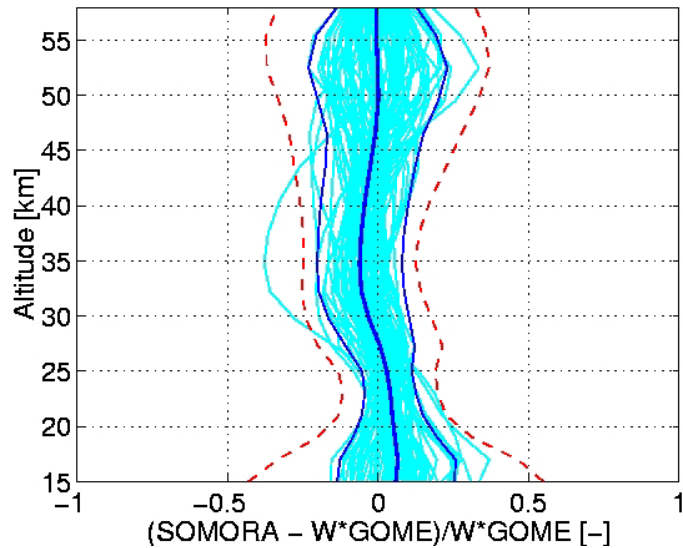# AK Comparison:
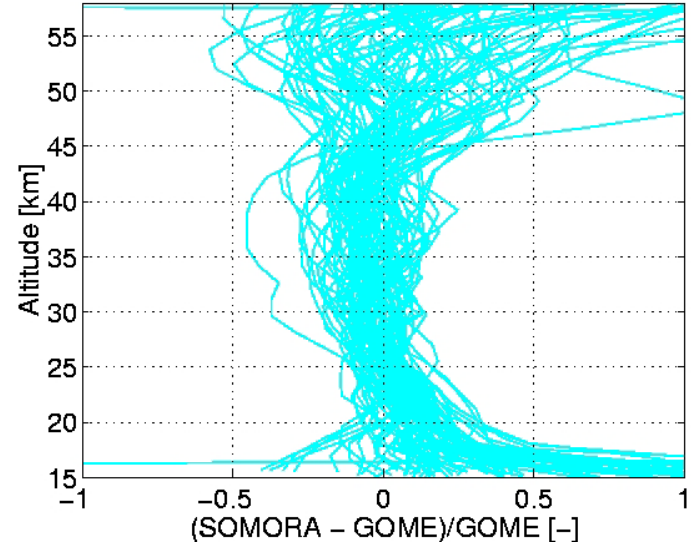

SOMORA AKs

GOME transf. AKs

Profile Comparison:

GOME transformed to SOMORA grid   SOMORA prof. retrieved on GOME grid

Conclusions and Outlook:

✓ Simple method to homogenize remote sensing measurements for comparison

✓ Does not require data re-processing

✓ Applied to intercomparison of SOMORA vs. GOME O_3 profiles

↪ Assess method limits or generalize to more tricky cases

↪ Include random errors in the analysis

↪ ...