Initial results on comparisons of dual soundings in RS92 -> RS41 transition

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Do we have an universal formula for harmonizing Vaisala transition ?

Some initial facts about RS41-RS92 difference understanding:

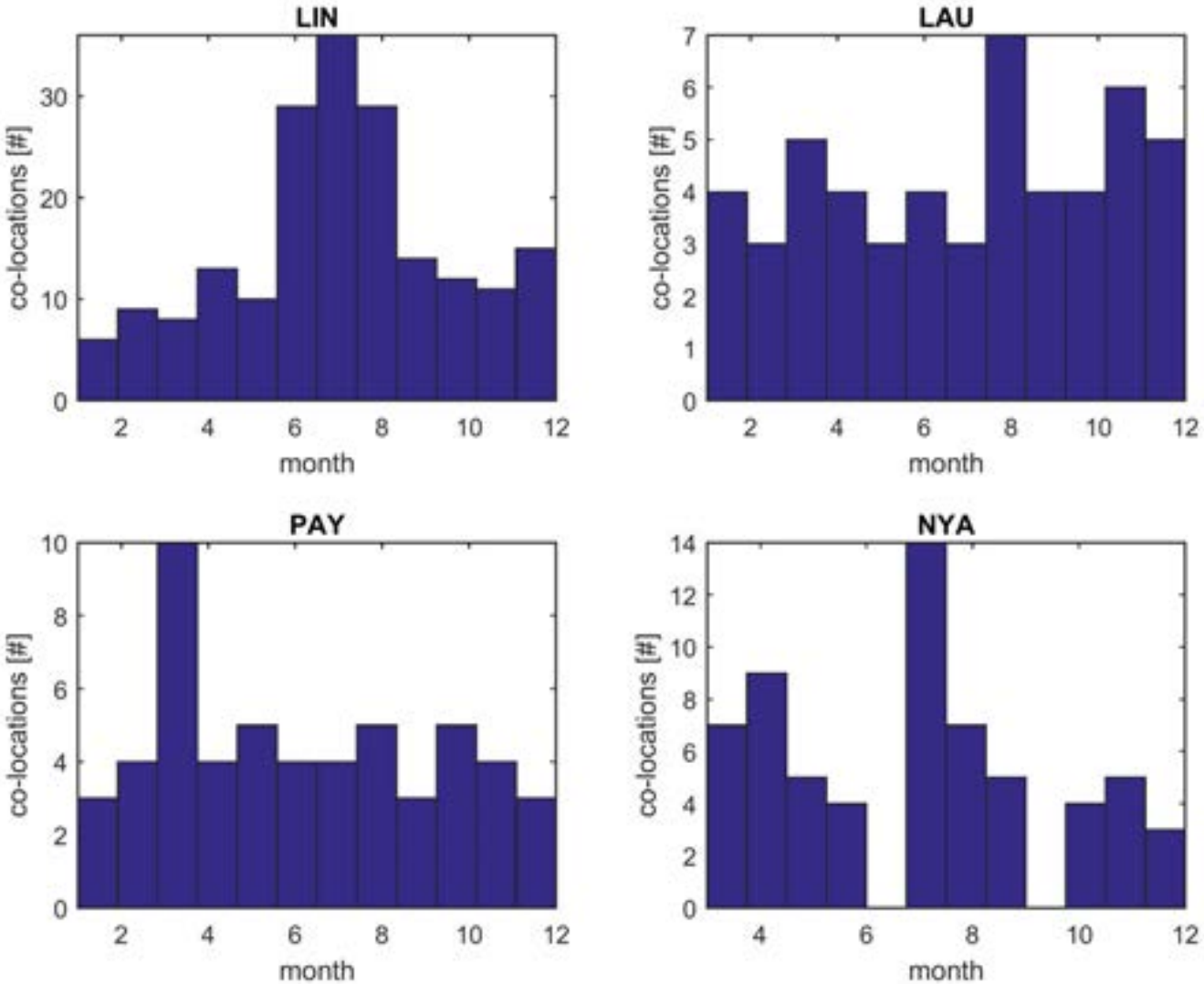
1. Use of GDP measurement uncertainty
2. Role of vertical correlation
3. Bias assessment using heteroskedastic local polynomial least squares.
4. Bias adjustment and harmonization

Dataset of dual soundings (DS)

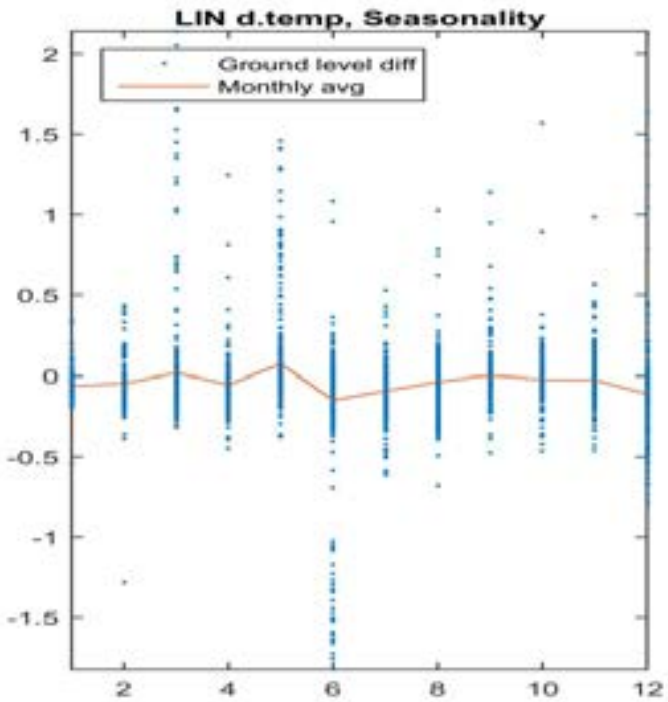
	co-loc #	from	to	Processor
Lindenberg	198	2014-12	2016-12	GDP
Payern	69	2015-02	2016-03	GDP
Ny Alesund	64	2015-03	2016-12	GDP
Lauder	56	2015-11	2016-11	EDT

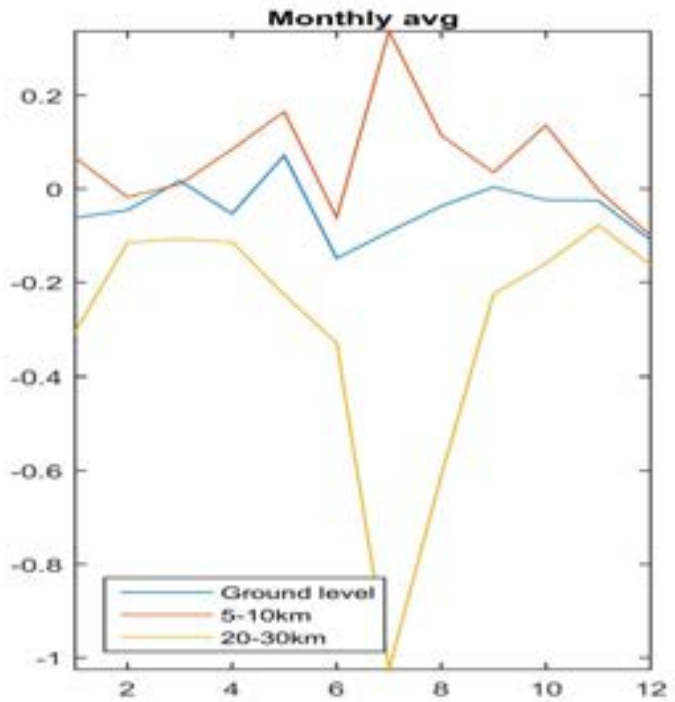
Only stations with more than 20 DS', years 2015-2016

Seasonality of DS campaign



Seasonality of T difference
Lindeberg





Seasonality of RH difference

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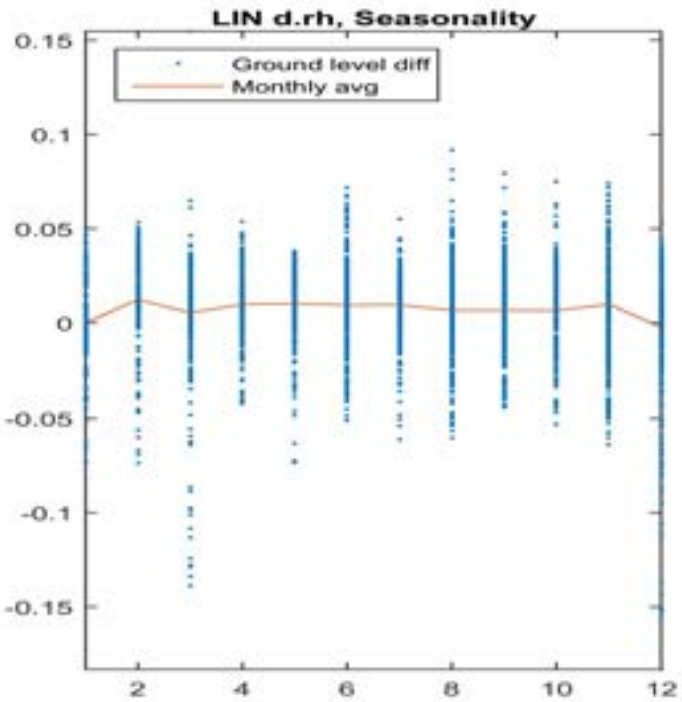

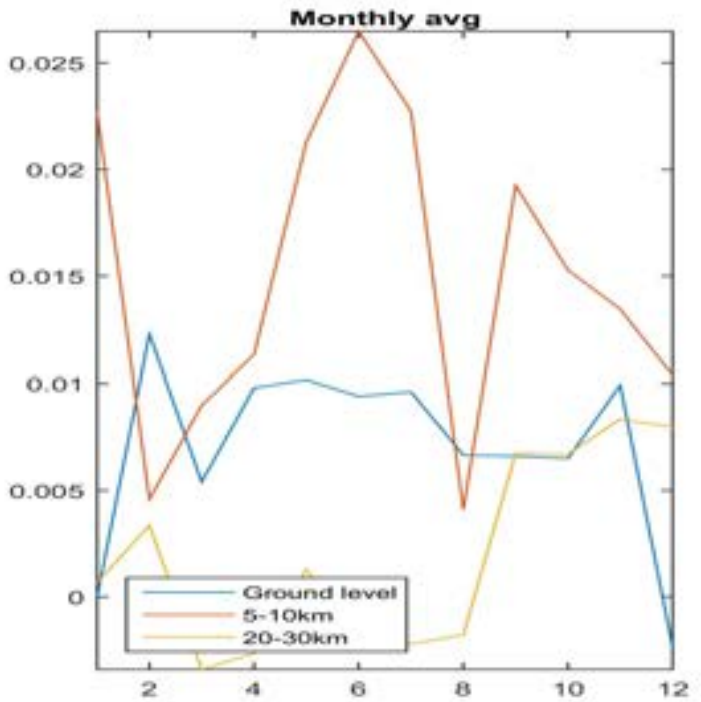

Modelling of bias

To assess RS41-RS92 difference bias of T&q at each altitude we assume that

$$bias = E\left(\text{measurement difference} \middle| \text{local conditions}\right)$$

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- No assumptions about smoothness of measurements are made.

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- Some results in the following pictures ...

Methods

For each site, bias at altitude h is denoted by $b(h)$ and is obtained by minimizing

$$\sum_{i,j} \left(y_{i,j} - b(h)\right)^2 K_\lambda \left(h_i - h\right) \omega_{ij}$$

where

$j = 1, ..., N$ (# of co-locations)

$i = 1, ..., n_j$ (# of measurements of co-location j)

$h_i =$ altitude of measurement $y_{i,j}$

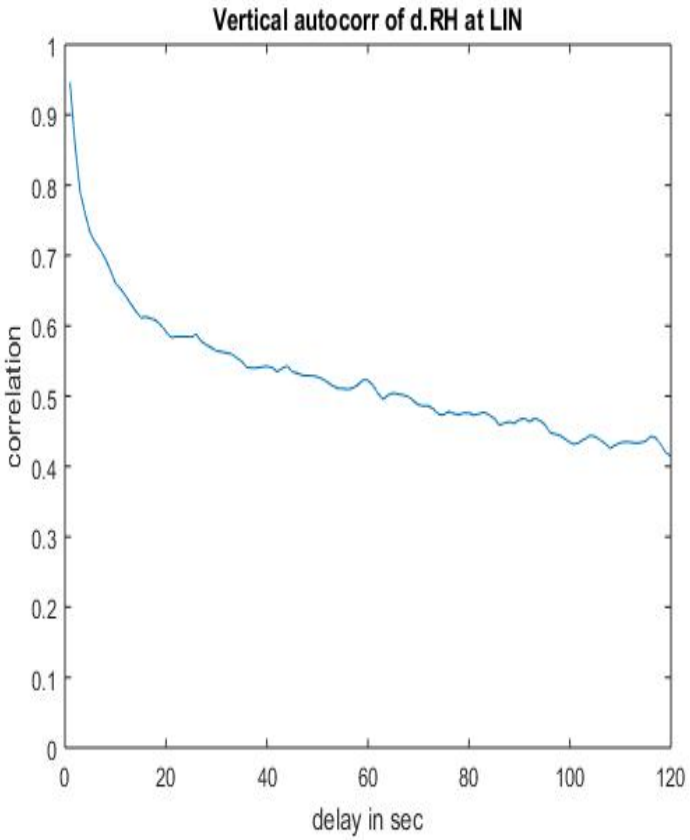
$K =$ Gaussian kernel with bandwidth λ ($\lambda = 100m$)

$\omega \propto uncertainty^{-1}$

Vertical correlation taken into account in IC's of α and β

Vertical correlation not taken into account in averaging and/or estimation

About vertical correlation



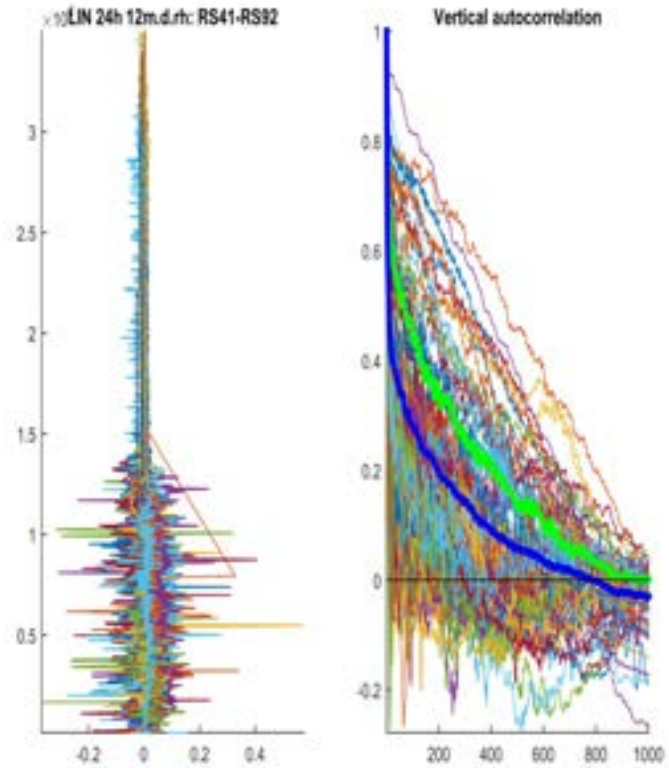


Figure: Lindenberg RH-difference vertical correlation. Left: short range. Right: long range.

Temperature mismatch (1/2)

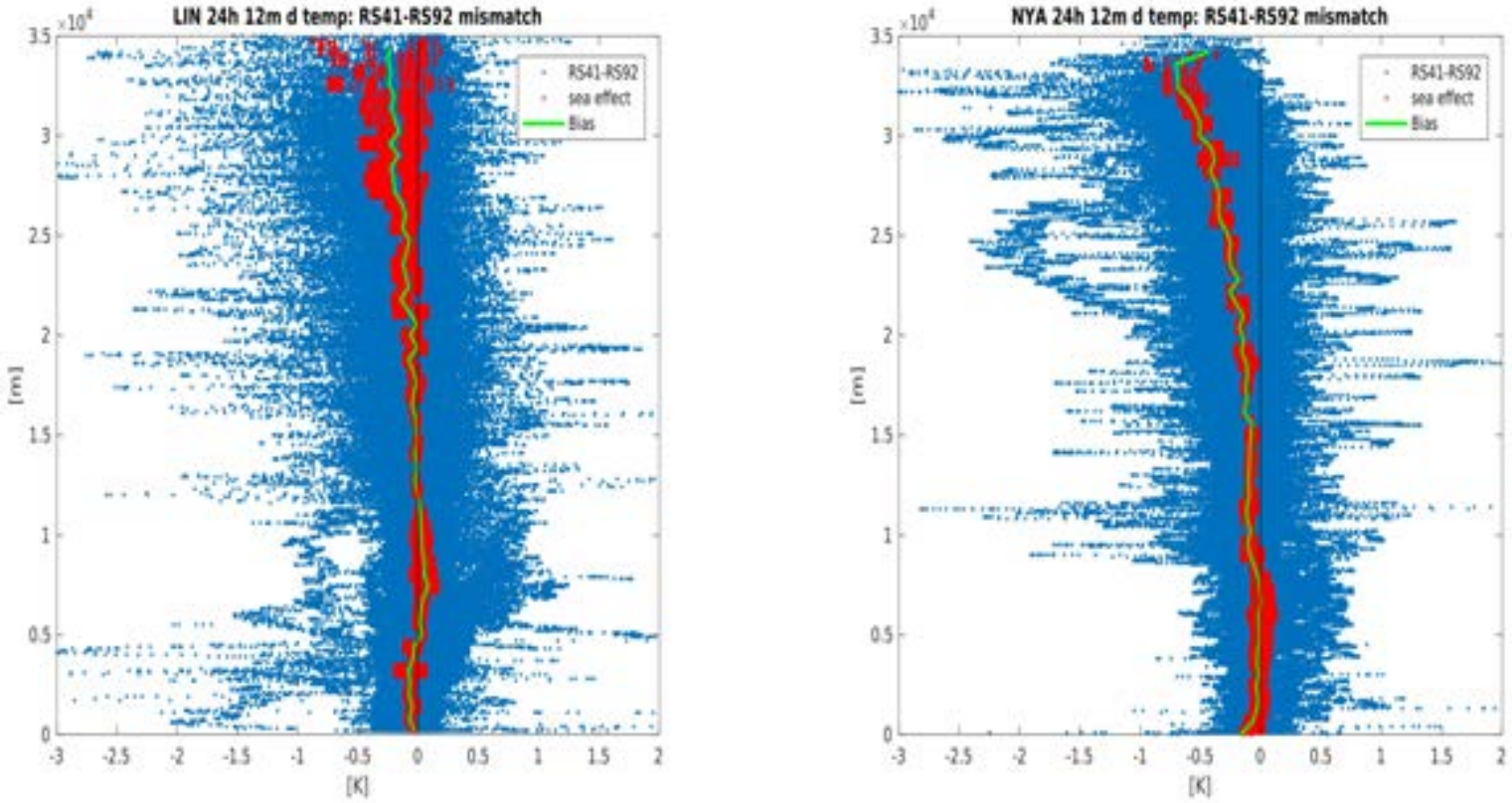


Figure: Lindenberg (Left) and Ny Alesund (Right) RS41-RS92 difference. SEA impact in red.

Temperature mismatch (2/2)

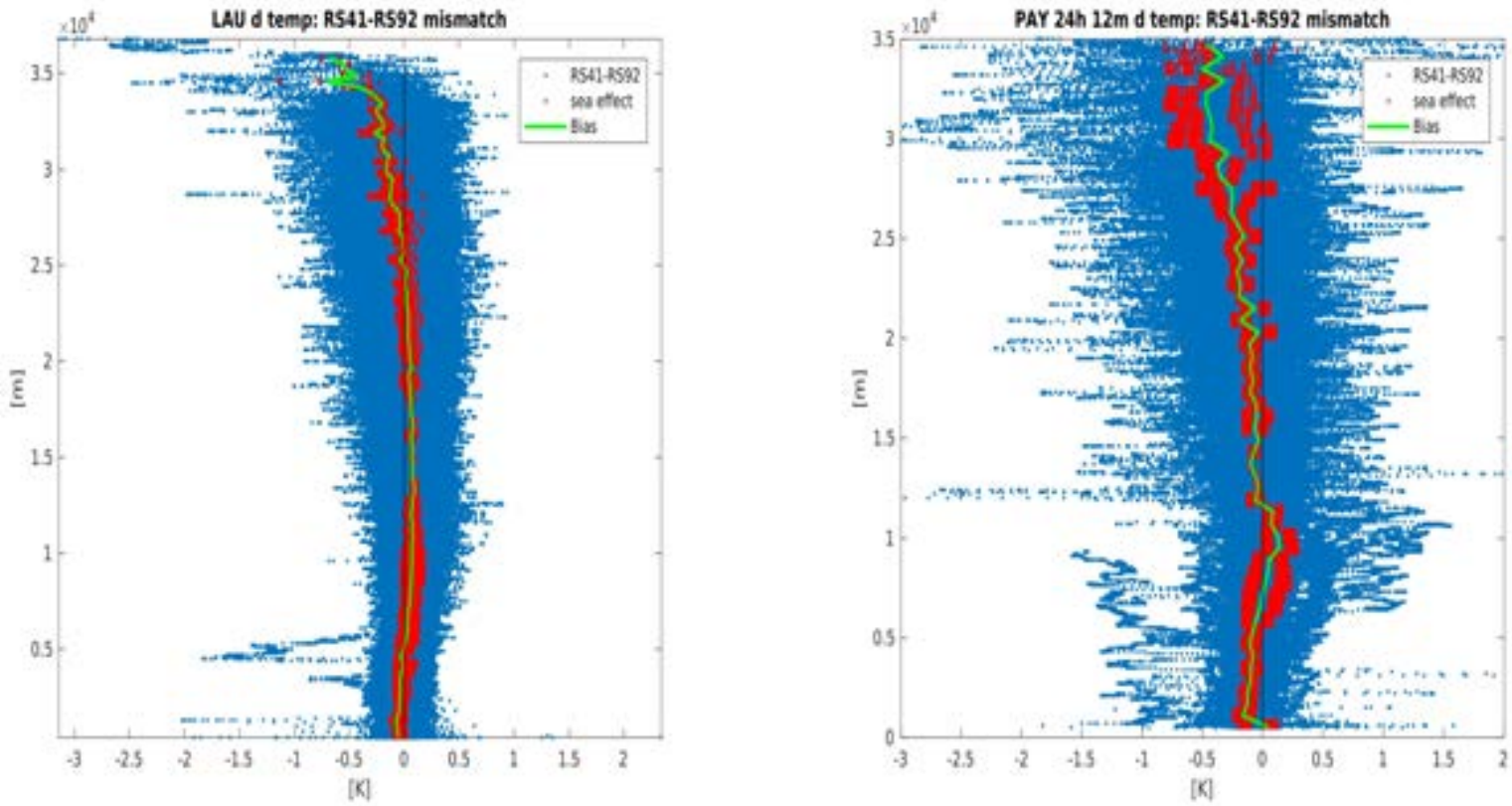


Figure: Lauder (Left) and Payerne (Right) RS41-RS92 difference. SEA impact in red.

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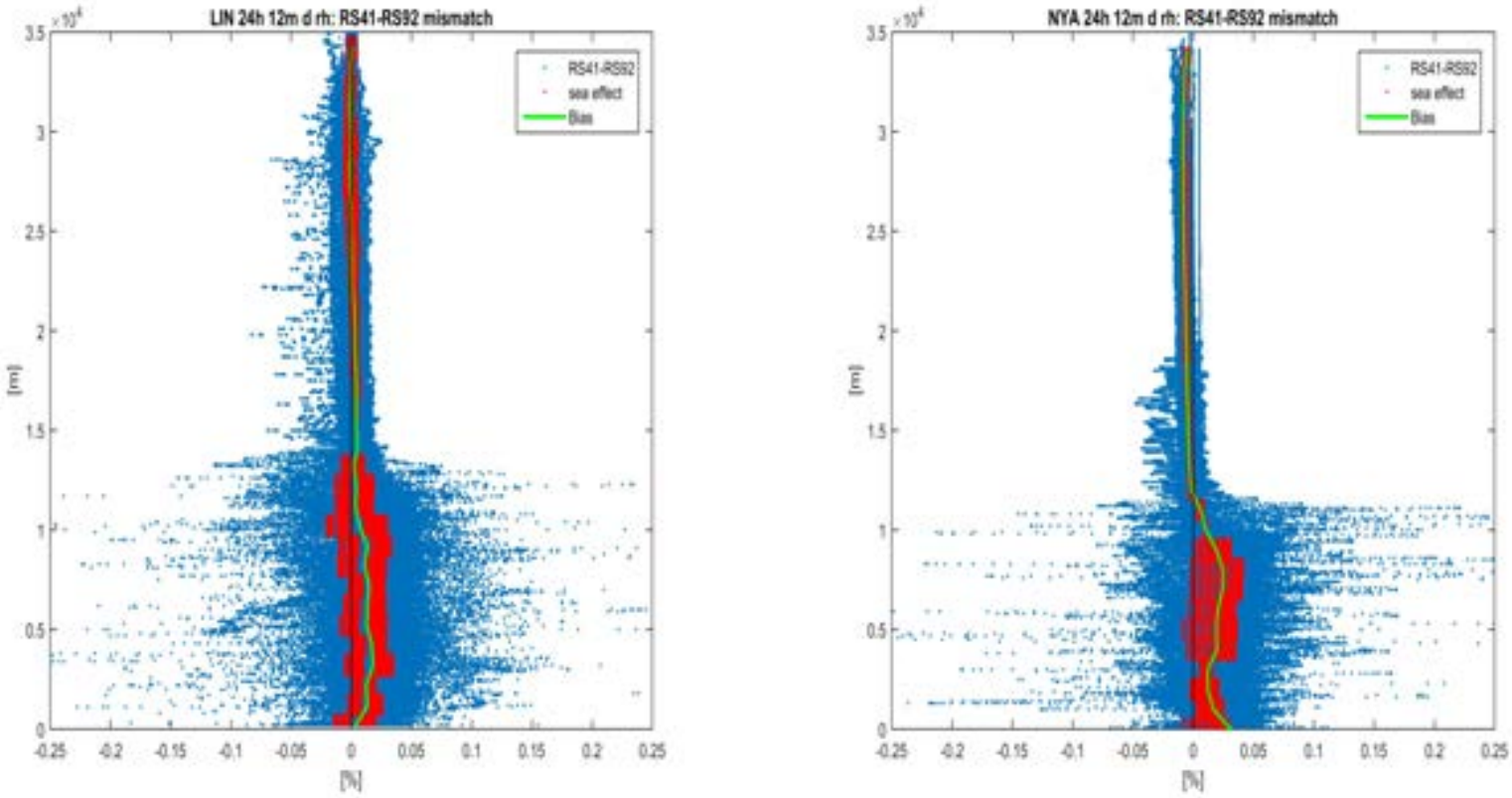

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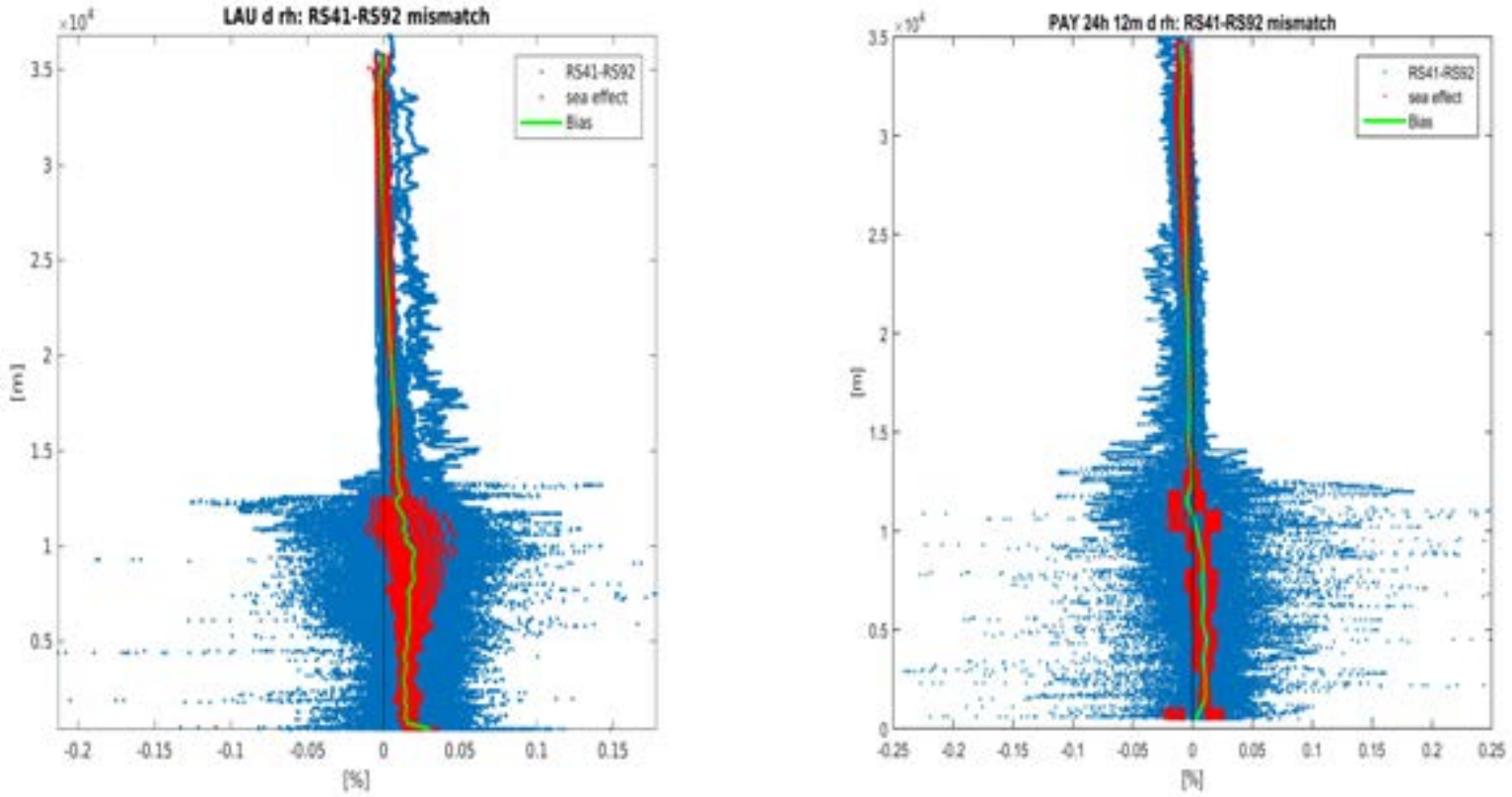

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- The above SEA model is estimated on the first and applied to the second one

Temperature Harmonization
Lindenberg valid. data

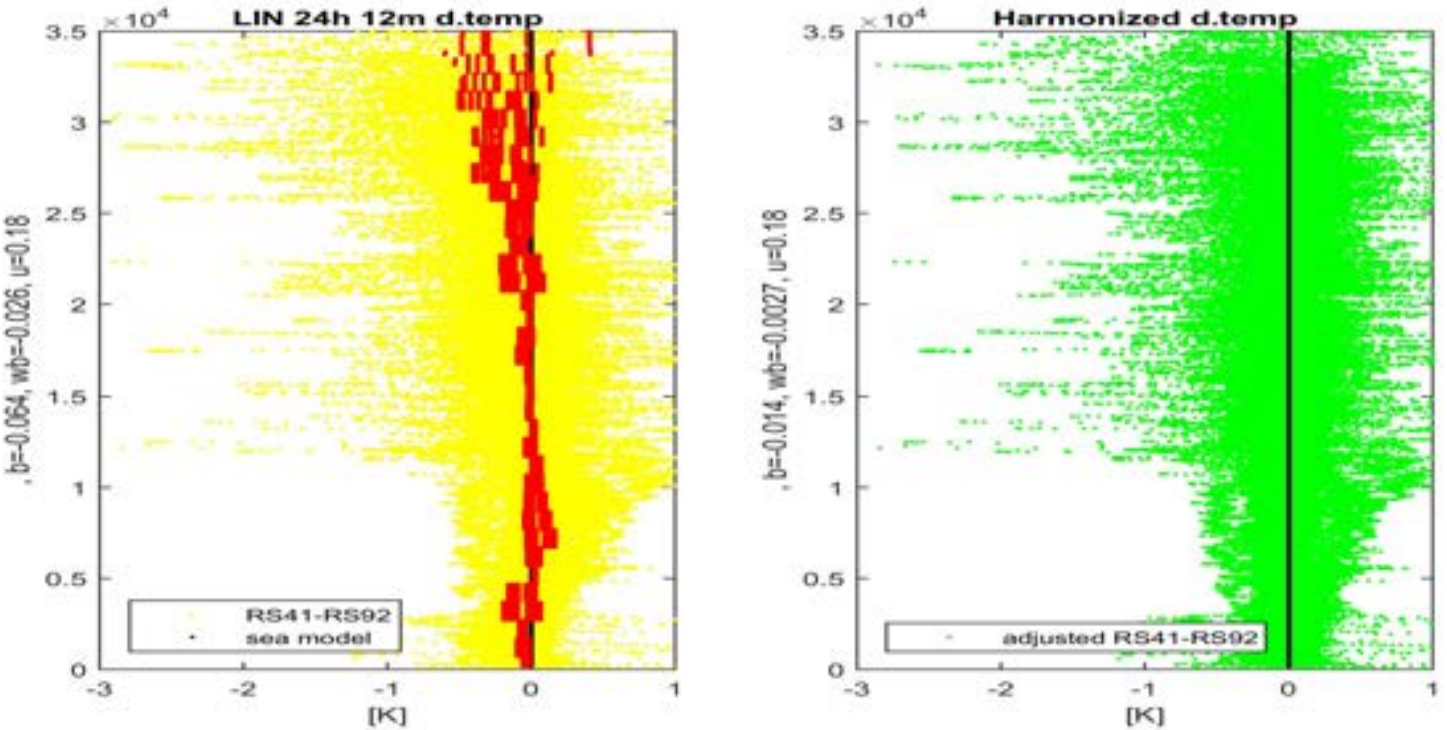
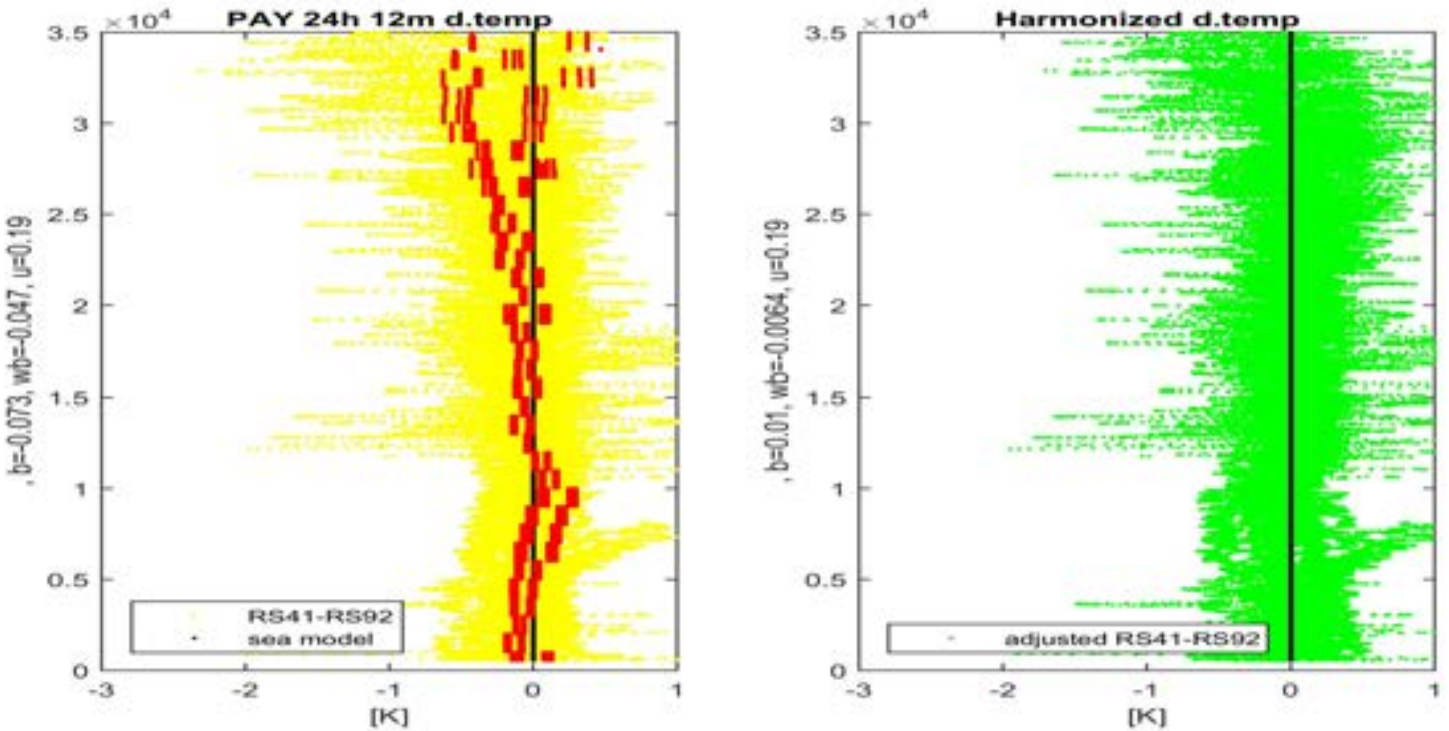


Figure: Left: differences and SEA effect in red. Right: differences after harmonization.

Temperature Harmonization
Payerne valid. data



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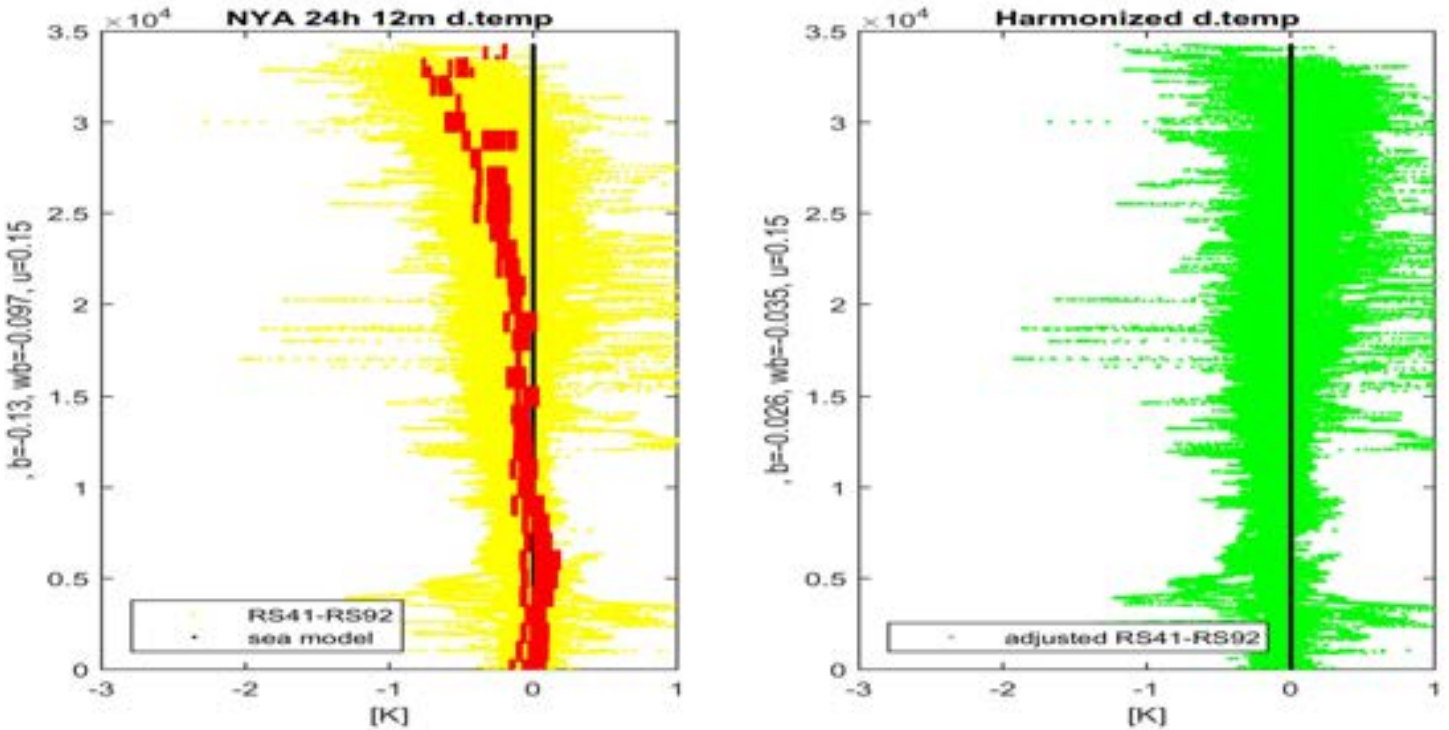

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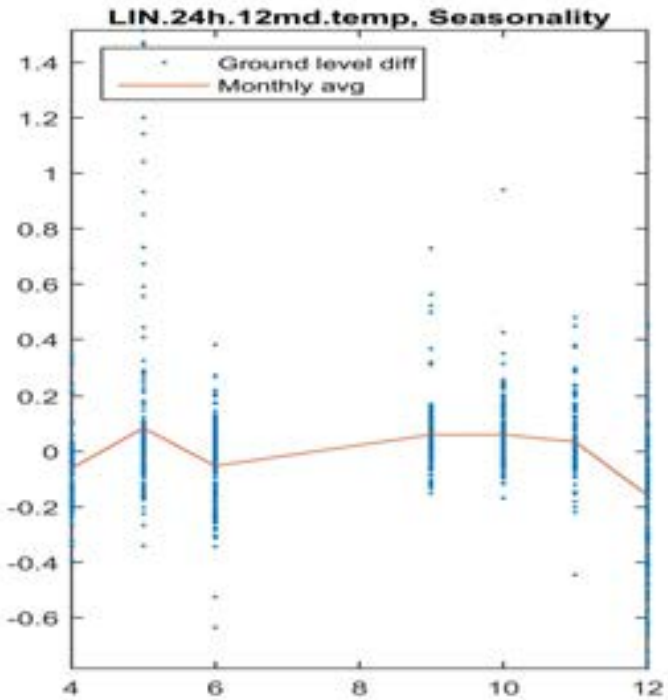
Is Seasonality filtered out ?



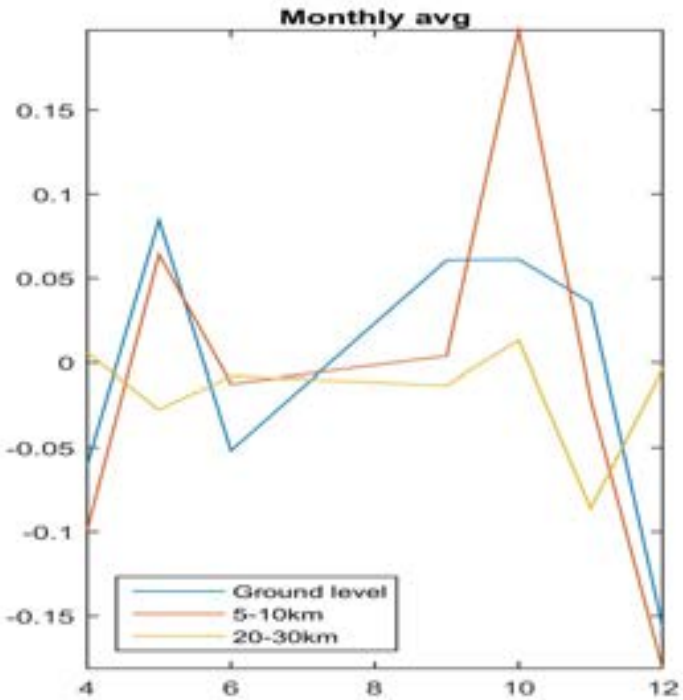
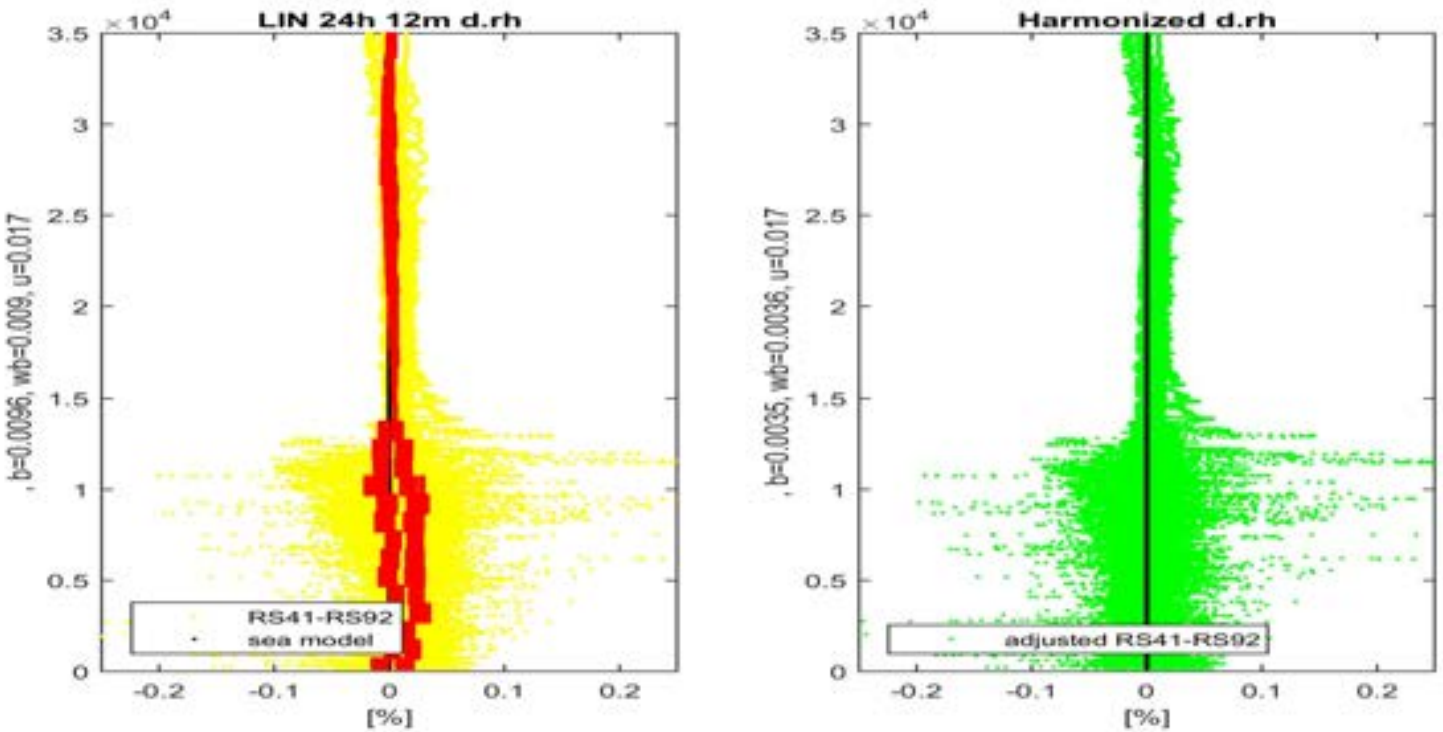


Figure: Monthly averages for differences of harmonized data.

RH Harmonization
Lindenberg valid. data



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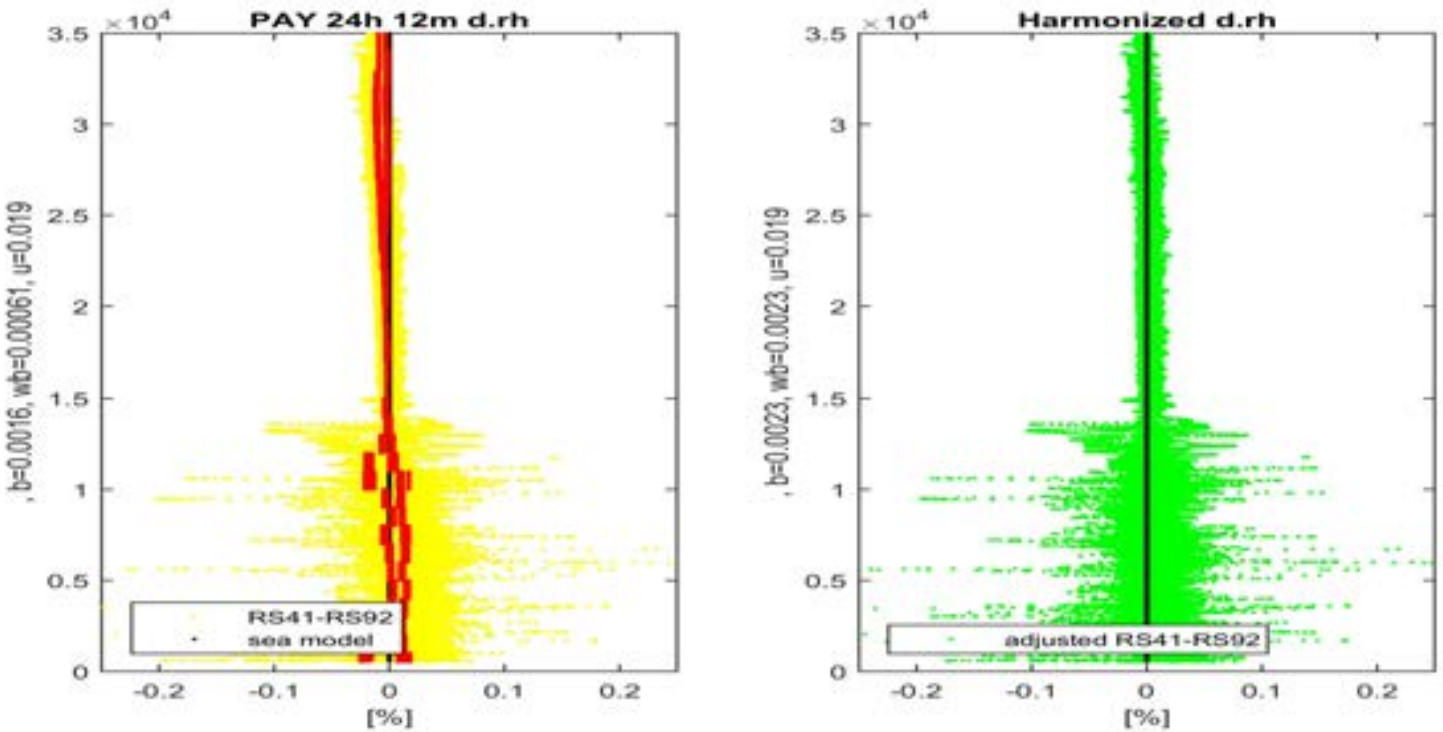

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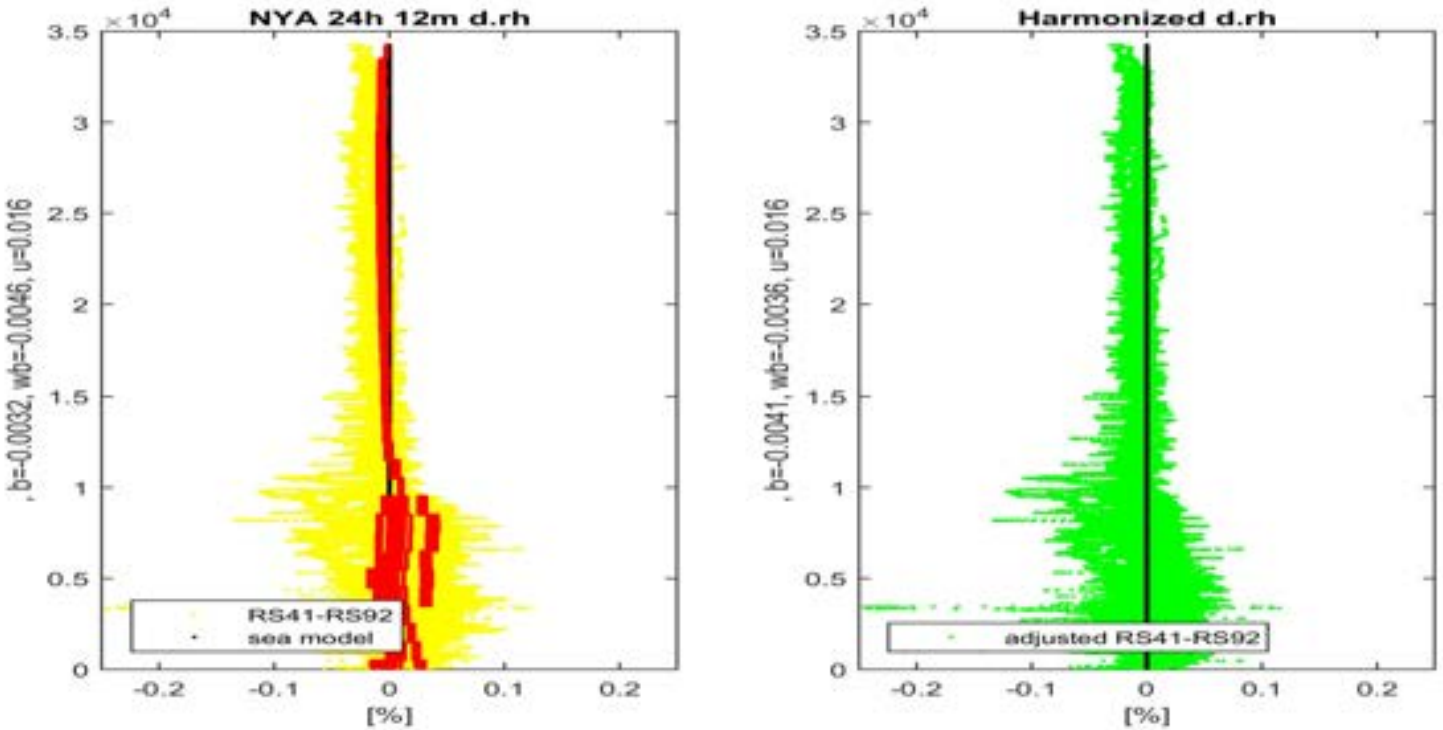

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  5. Considering a model "local" in state instead or in addition to altitude.

THANKS FOR YOUR ATTENTION