



Another look at the SEVIRI/IASI comparison in the 3.9 band

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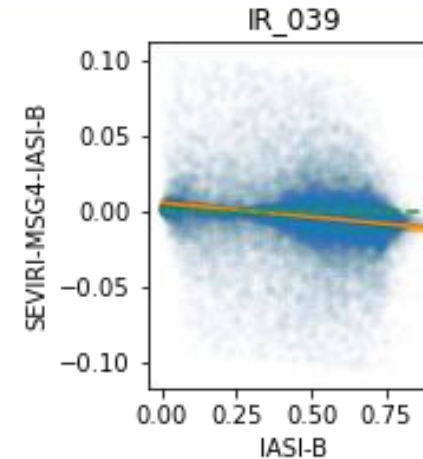
Andreas Brunn

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Background

- ✓ Lots of discussion around the negative radiances in the 3.9 μm band at the last GSCIS IR subgroup meeting in January 2021
- ✓ Indeed, in the 3.9 band, the radiances are close to 0 and noisy → Radiances can be negative
- ✓ It was then impossible to use those spectra, especially for cold scenes, and then impossible get brightness temperatures
- ✓ The spectra are not flagged because they are good → this was discussed
- ✓ Lots of solutions have been discussed, such as the gap-filling techniques for the negative radiances



Scatterplots of collocated radiances SEVIRI-IASI. Blue points show collocated radiances ($\text{mW}/\text{m}^2/\text{sr}/\text{cm}^{-1}$). Orange lines show weighted radiance regression

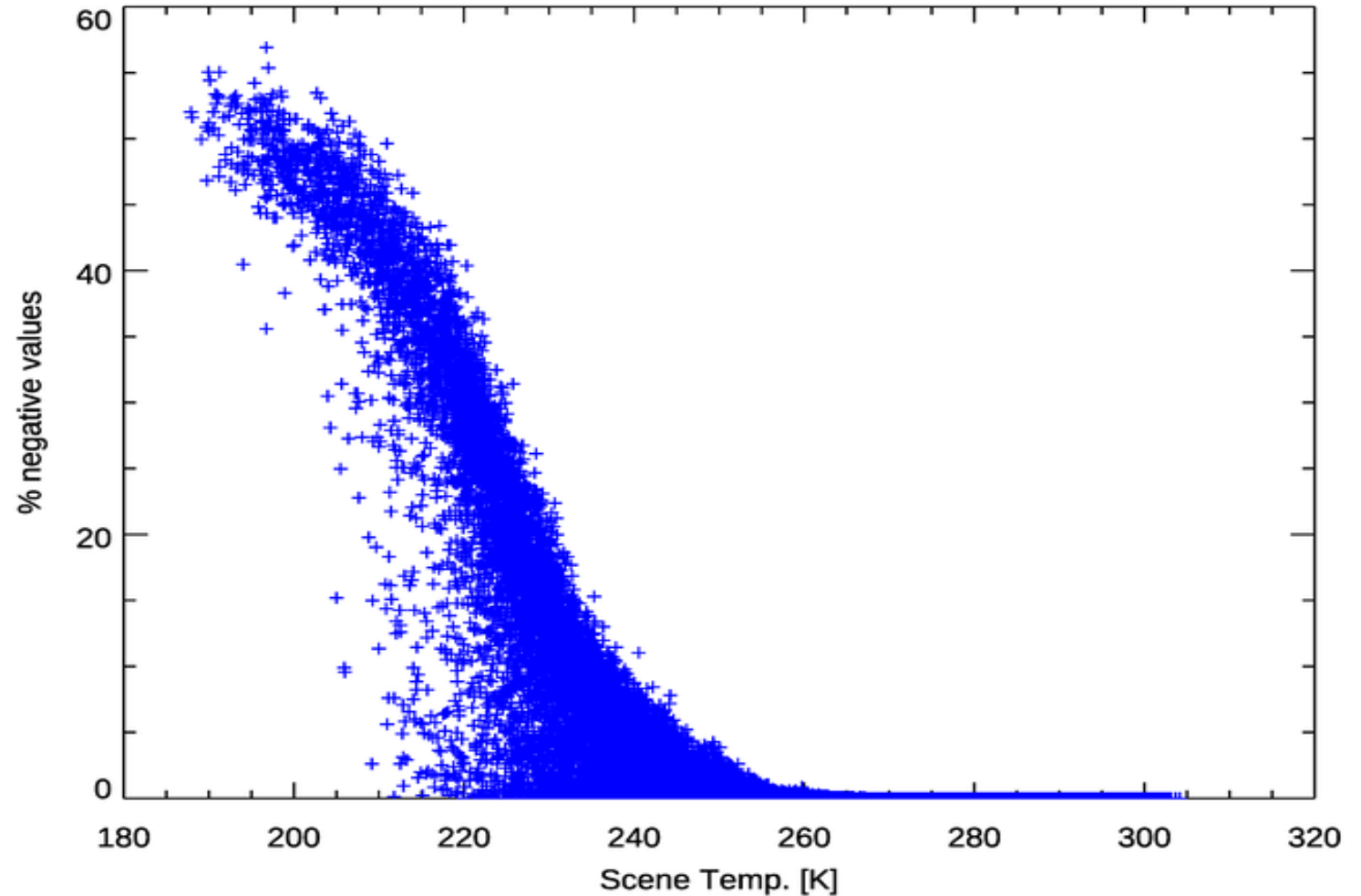
Credit: Tim Hewison



We have decided to look at those negative radiances, and to find another solution to cope with those negative radiances.

Negative radiances - statistics

- ✓ **Percentage of negative radiances in the 3.9 Band**
- ✓ **All scenes considered**



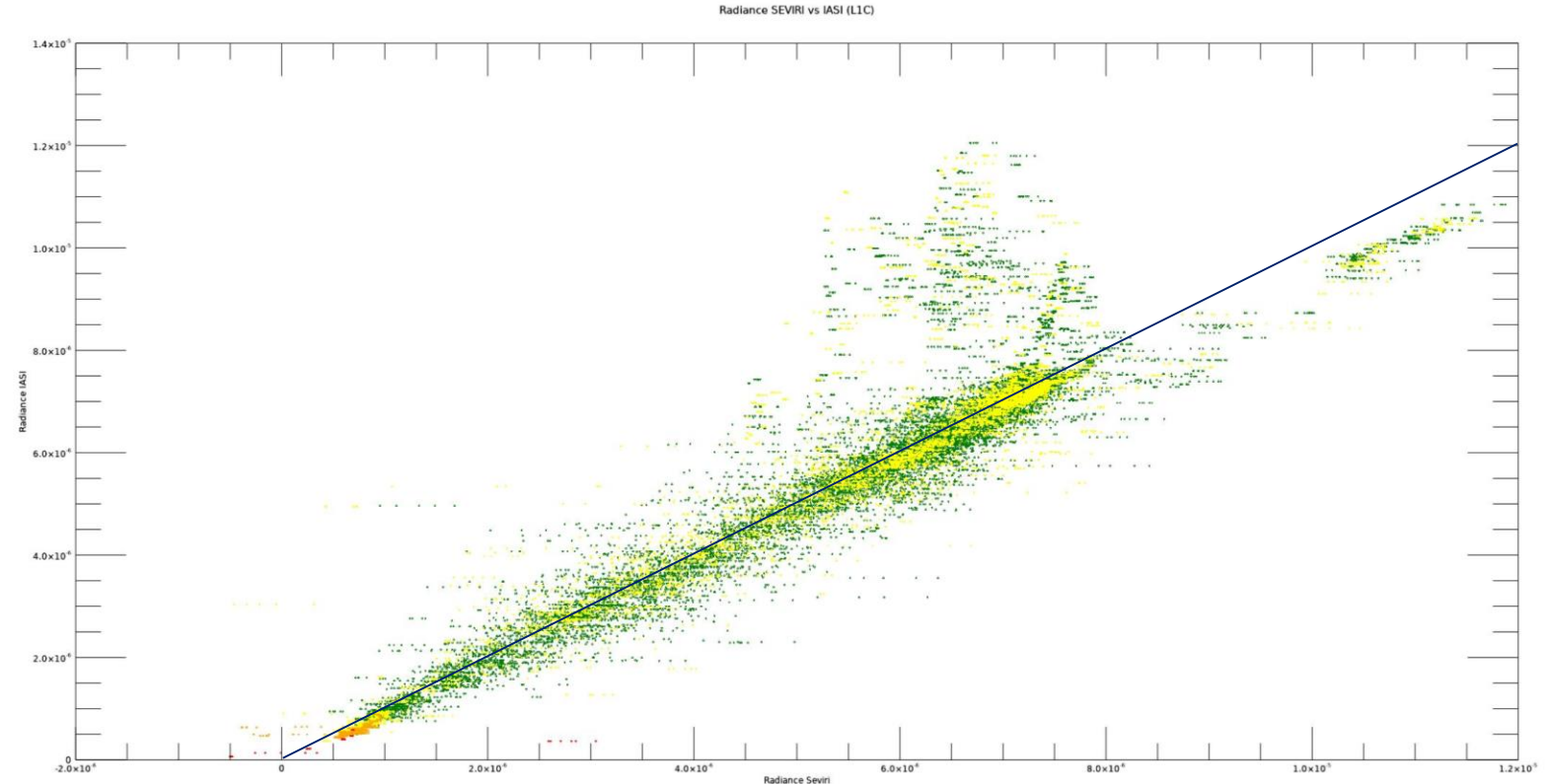
Negative radiances using IASI L1c

✓ **No negative radiance**

✓ **Less than 10
negative radiances**

✓ **Between 10 and 50
negative radiances**

✓ **More than 50
negatives radiances**



What can we do with the negatives radiances?



✓ We see that:

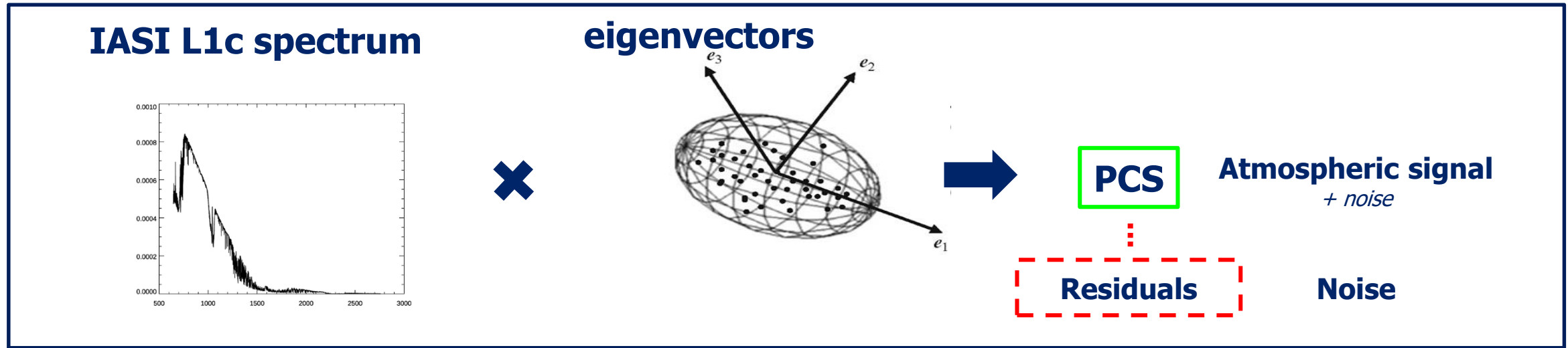
- ✓ Negatives IASI radiances (less than 10) for all scenes
- ✓ Only very cold scenes are affected by more than 10 negatives IASI radiances
- ✓ For the cold scenes, the percentage of negatives radiances can reach 50%

✓ So:

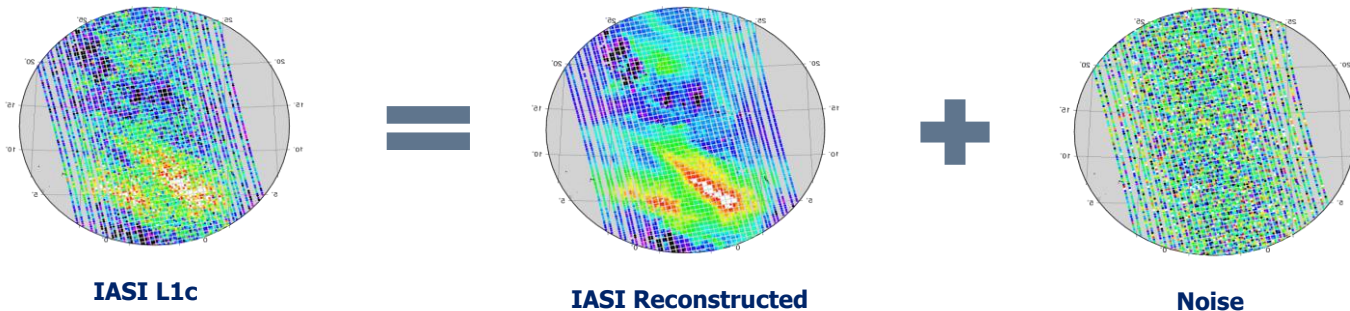
- ✓ It is possible to compare IASI and SEVIRI in radiances, so the negative IASI radiances should not be filtered before the convolution (also presented by Tim Hewison in January 2021)
- ✓ It is crucial to compare IASI and SEVIRI in the radiances domain and transform into brightness temperatures at the end
- ✓ Negative radiances are due to the radiances close to 0 + IASI noise in that band
- ✓ The best would be to filter out the noise from the radiances to reduce the number of negative radiances

IASI Principal components compression

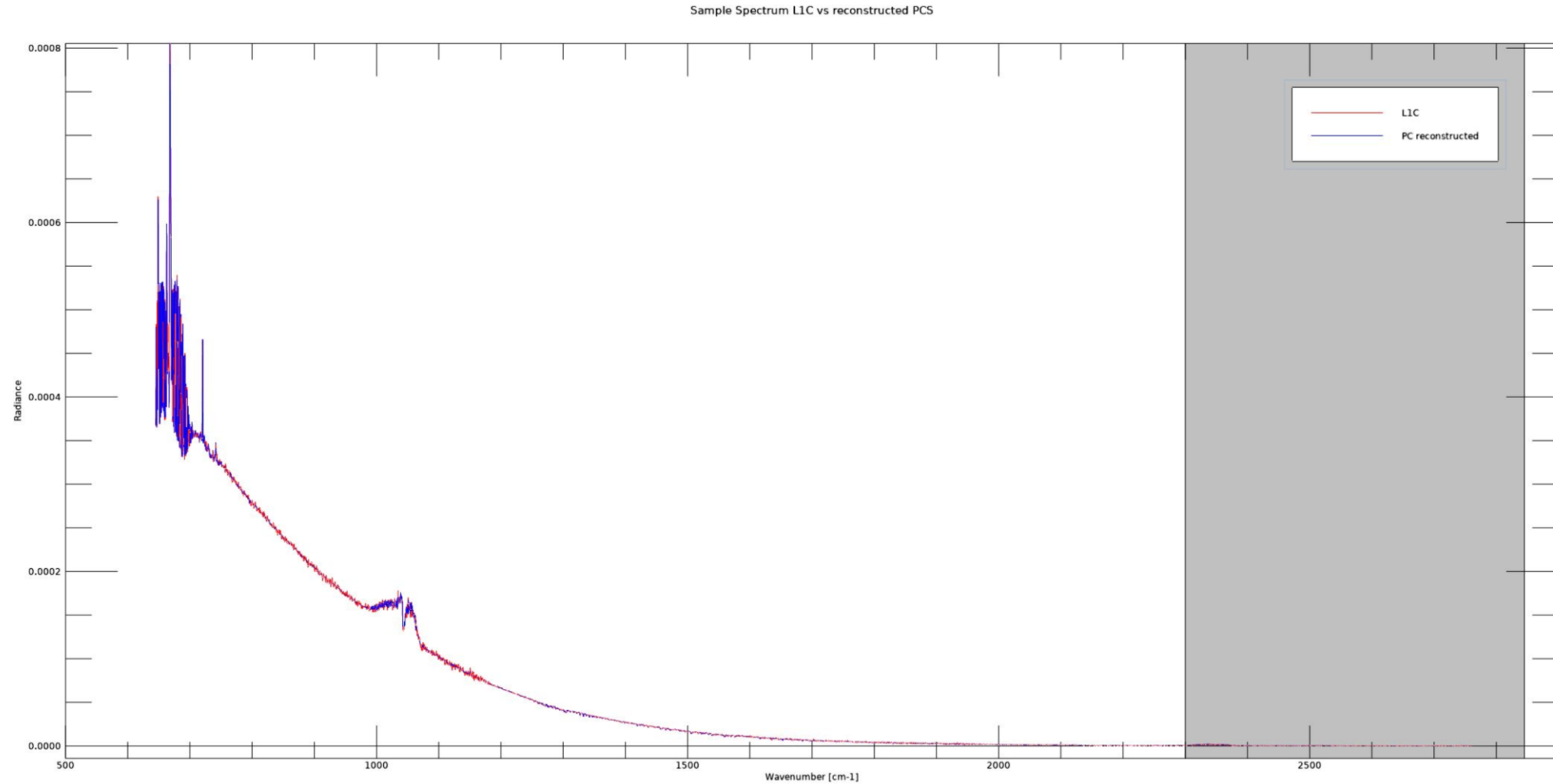
✓ Methodology:



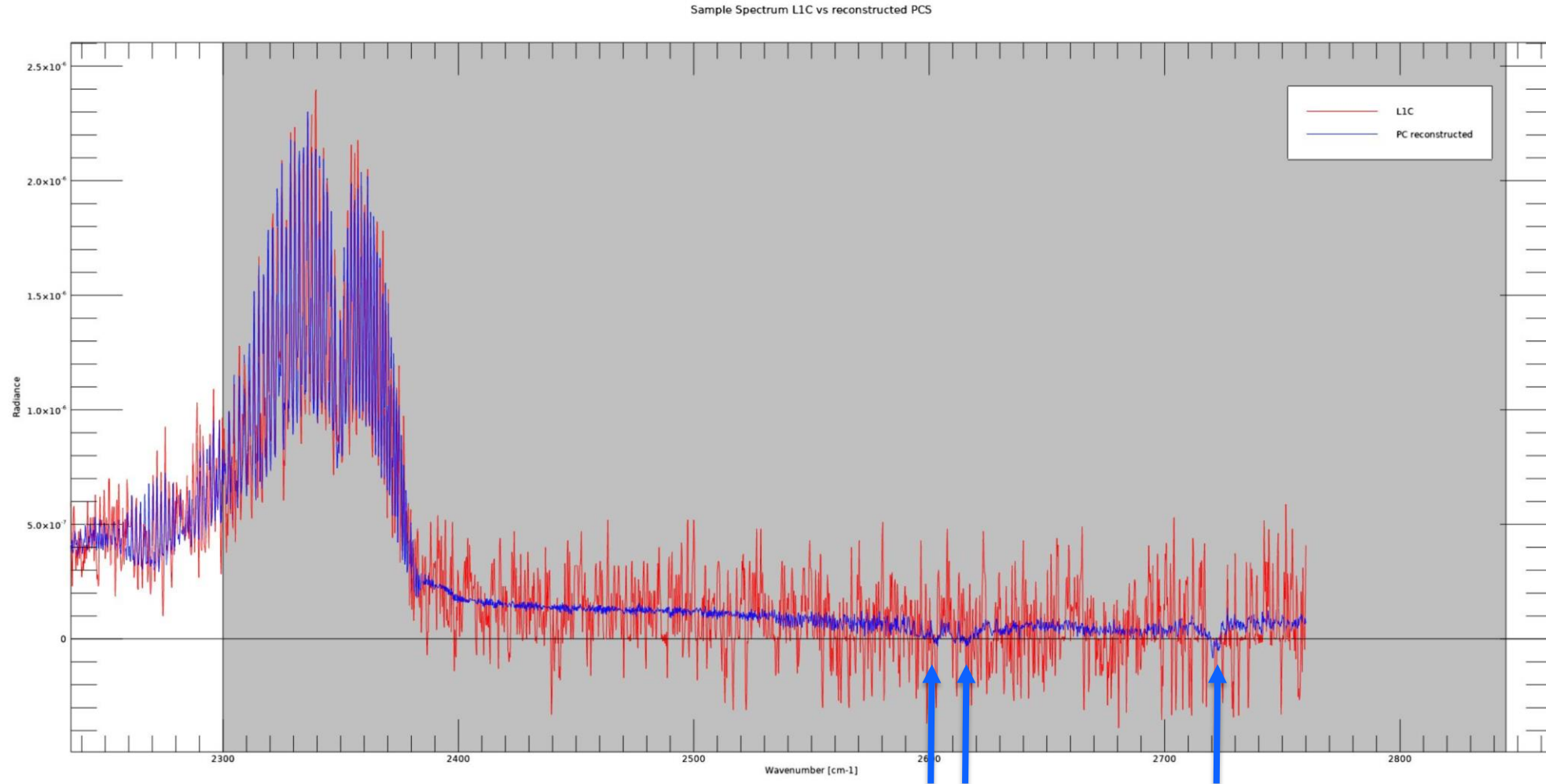
✓ It decomposes the signal such as some noise can be filtered out :



Example of reconstructed radiances



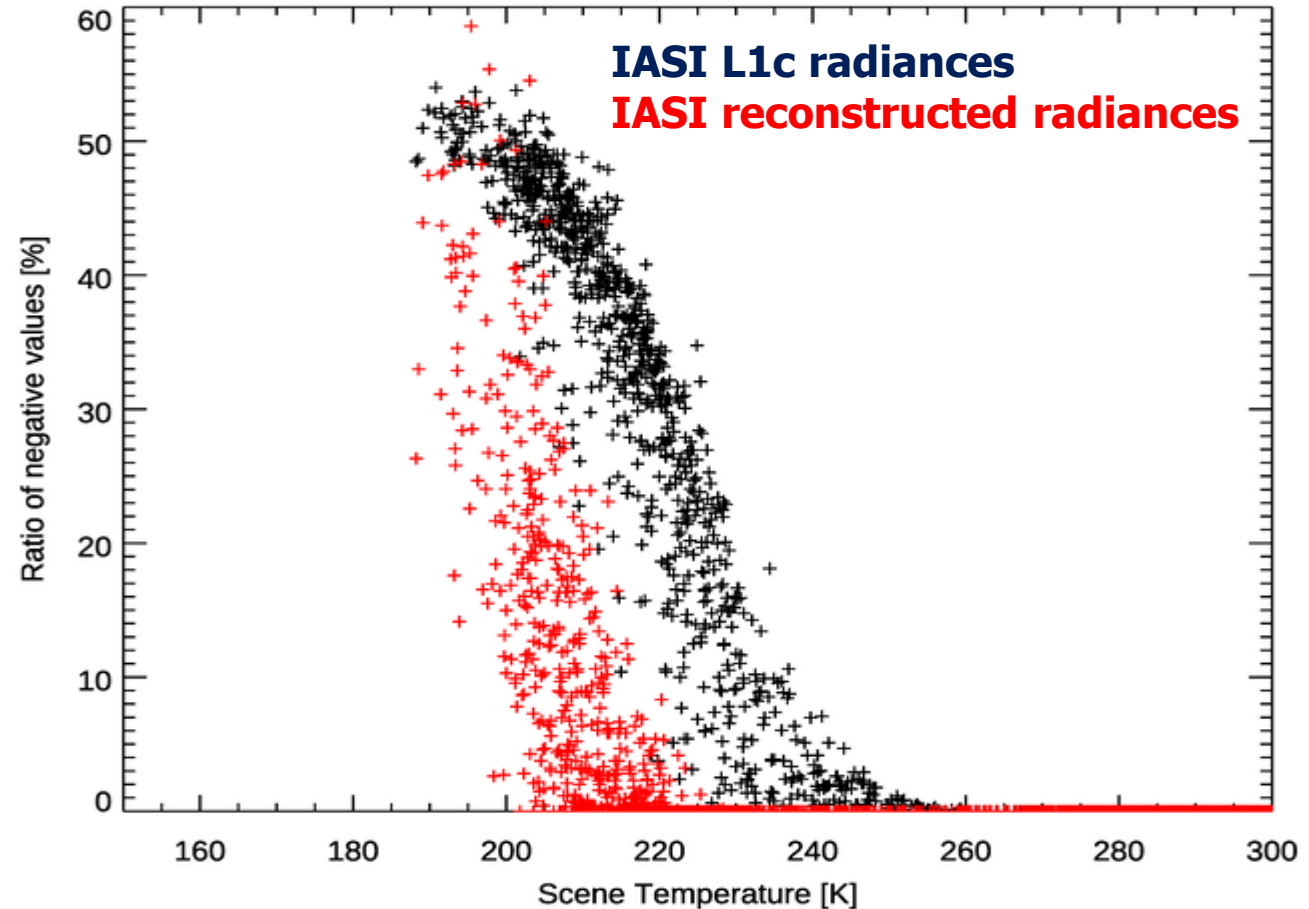
Example of reconstructed radiances



Few remaining negative radiances

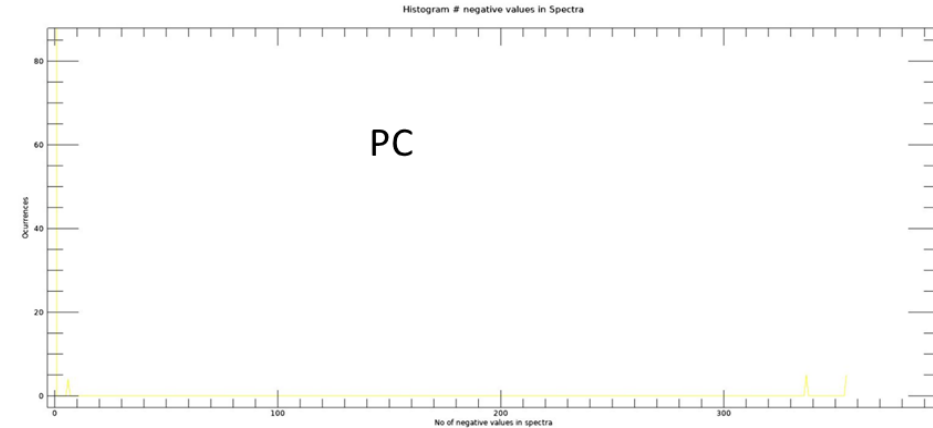
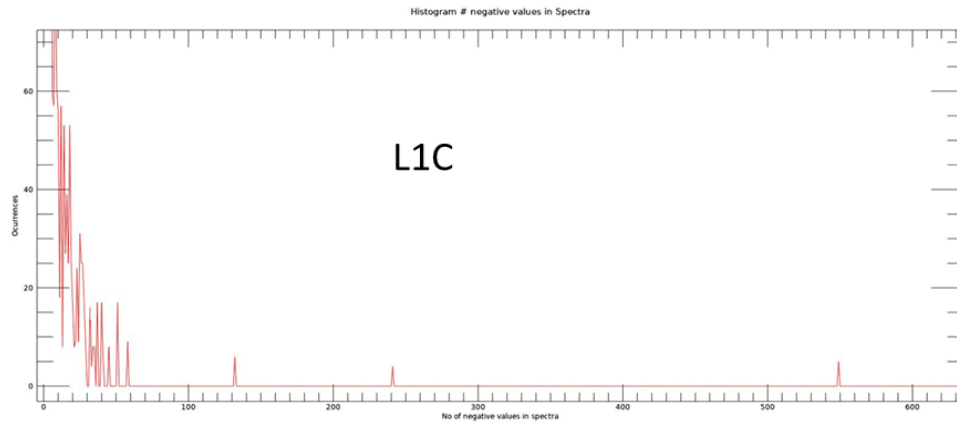
Advantage of using reconstructed radiances

- ✓ Percentage of negative radiances in the 3.9 Band
- ✓ Only homogeneous scenes considered



Advantage of using reconstructed radiances

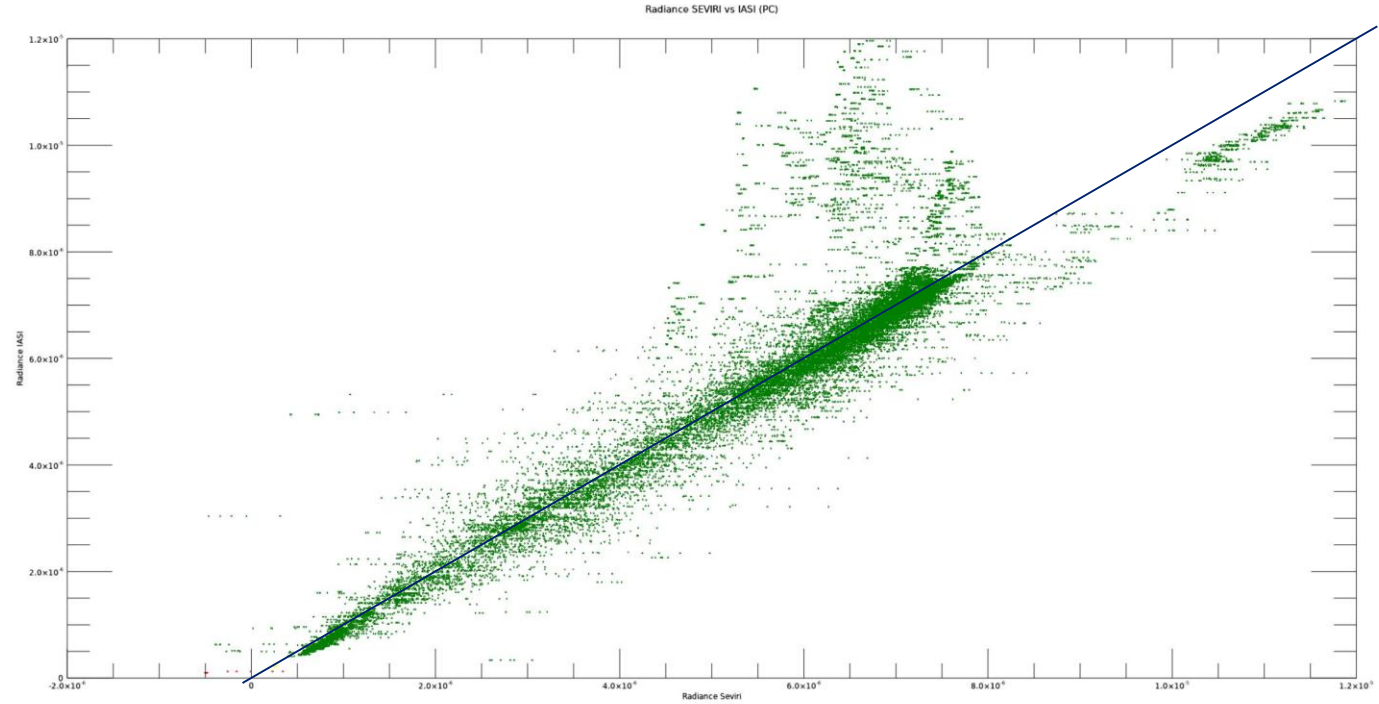
Date	Tot No. of Spectra	Tot. negative spectra (L1C)	Tot. negative spectra (PC)	Max negatives in spectrum (L1C)	Max negatives in spectrum (PC)
Mar 15, 2021	29878	10502	227	1240	1245
Mar 15, 2021 (excluded bad)	28990	10118	14	633	355
Mar 16, 2021 (excluded bad)	29604	8696	7	395	44
Mar 17, 2021 (excluded bad)	30347	8367	12	807	436



➔ Huge reduction of negative radiances

Negative radiances using IASI PCS

- ✓ **No negative radiance**
- ✓ **Less than 10 negative radiances**
- ✓ **Between 10 and 50 negative radiances**
- ✓ **More than 50 negatives radiances**



Date	Temperature Difference L1C	Temperature Difference PC	Uncertainty (STD) L1C	Uncertainty (STD) PC
Mar 15, 2021	0.0864120	0.0864651	0.732847	0.732544
Mar 16, 2021	-0.115934	-0.116060	0.700744	0.700421
Mar 17, 2021	0.0792975	0.0806038	0.814910	0.815580

Main outcomes:

- ✓ IASI and SEVIRI can be compared in the 3.9 band but the negative radiances should not be filtered out before the convolution
- ✓ The use of the operational IASI L1 PCS products reduces drastically the negative radiances in filtering out the noise

This study did not address the issue with IASI not covering the whole 3.9 band

Thank you for the attention!