RETRIEVAL ADVANCES OF BrO/SO2 MOLAR RATIOS FROM NOVAC

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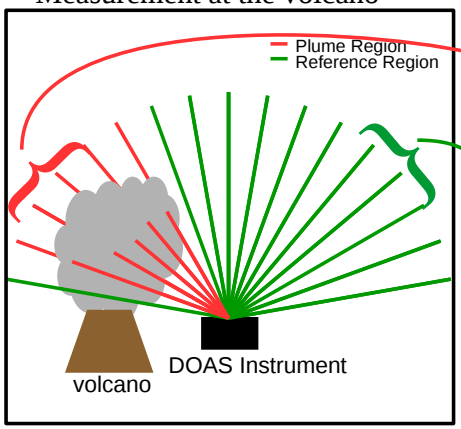
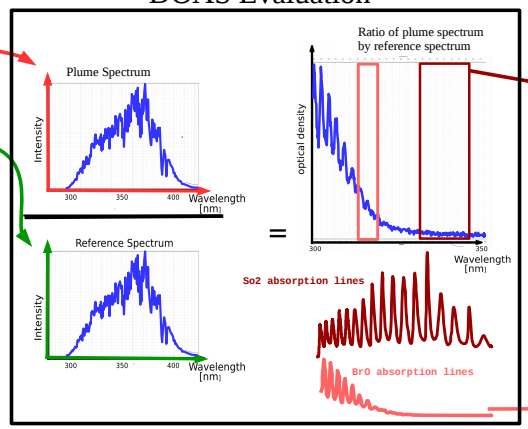
Established Routine

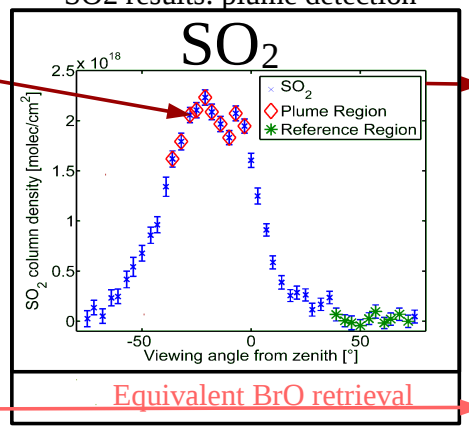
Measurement at the volcano



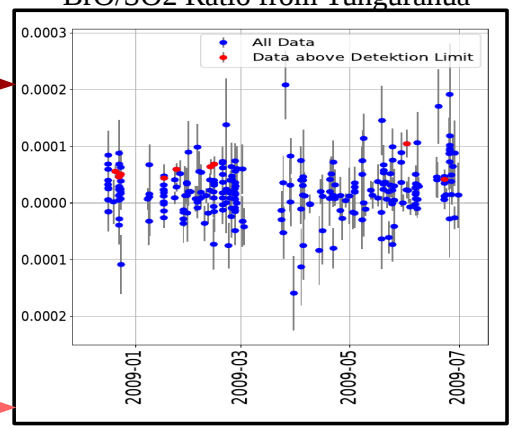
DOAS Evaluation



SO2 results: plume detection

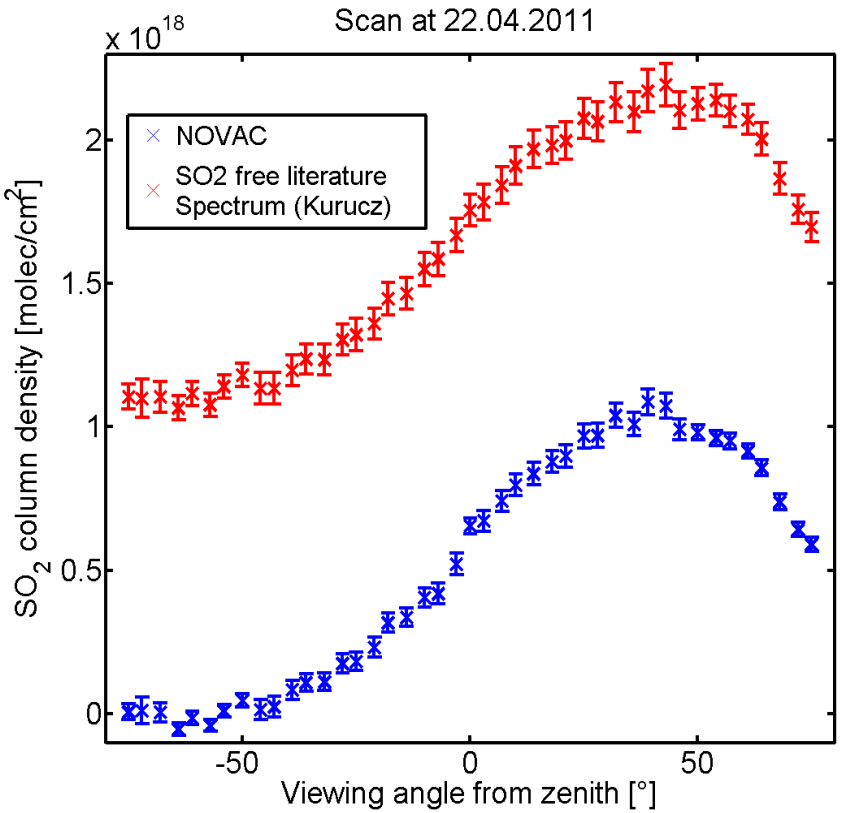


BrO/SO2 Ratio from Tungurahua



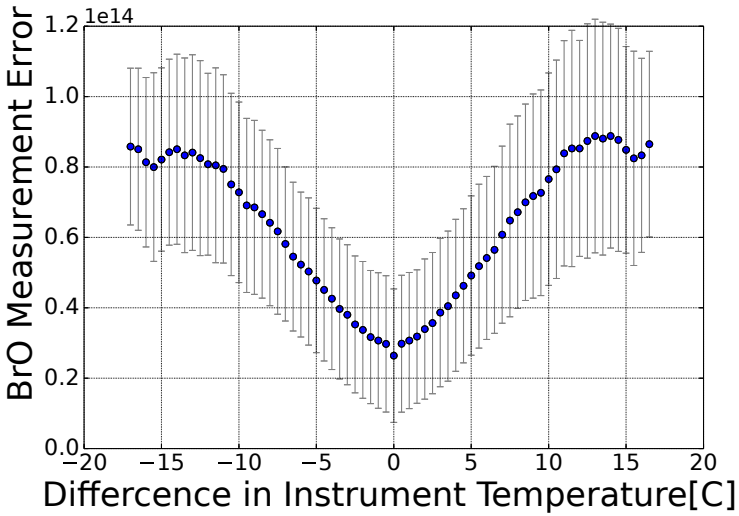
Contamination Problem

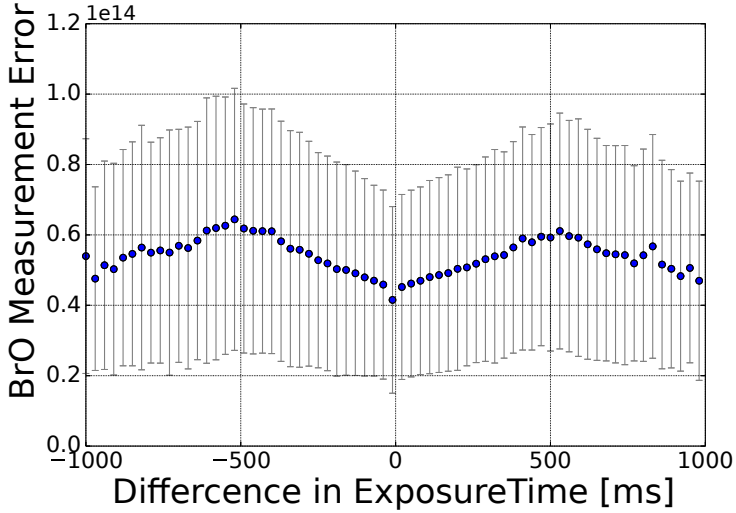
- In total ca. 7% of the Data are contaminated

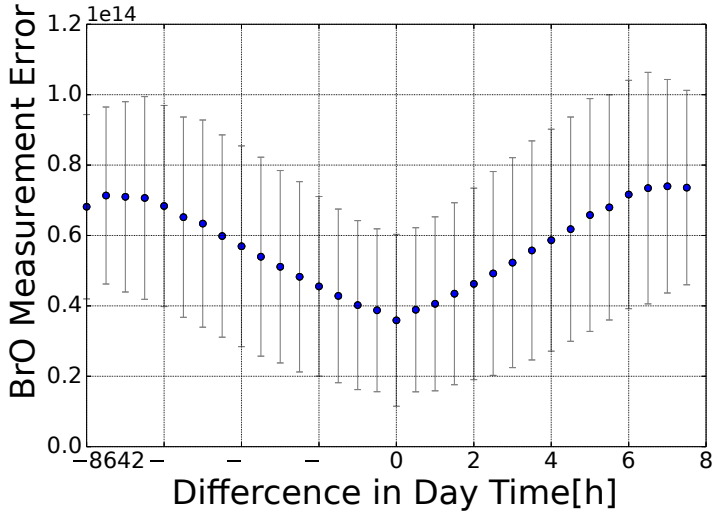


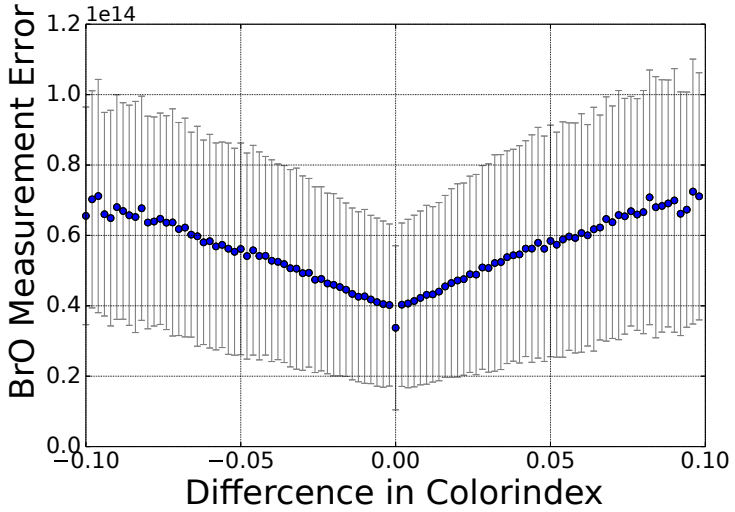
In the following we only work with the contaminated data

BrO Error dependency on variables









Calculations

- linear approximation of the Data

$$\Delta\epsilon_{BrO} = a_t \cdot \Delta t + a_{temp} \cdot \Delta temp + a_{daytime} \cdot \Delta daytime + a_{coloridx} \cdot \Delta coloridx$$

Calculations

Hereby are the constants

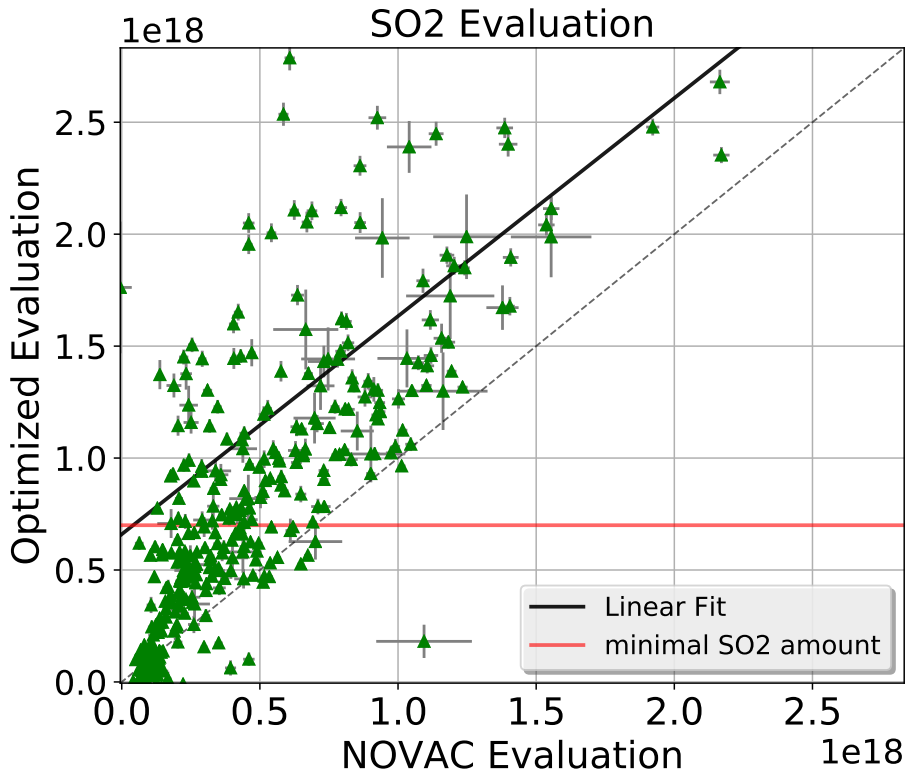
Constant	importance	deviation
a_T	0.661	29%
a_{ET}	0.011	164%
a_t	0.133	50%
a_{dt}	0.138	65%
a_c	0.061	136%

Results

- Results only for contaminated data
- Data are treated as contaminated if the SO2 column density is larger as $2 \cdot 10^{17} \quad \frac{molec}{cm^2}$
- Plume data are reliable if the SO2 column density is larger as $7 \cdot 10^{17} \quad \frac{molec}{cm^2}$
- The results are described relative to an optimal evaluation
- The optimal Evaluation is done by choosing the smallest total error
- If the relative error is larger than 5 we don't use the data

SO2 Evaluation

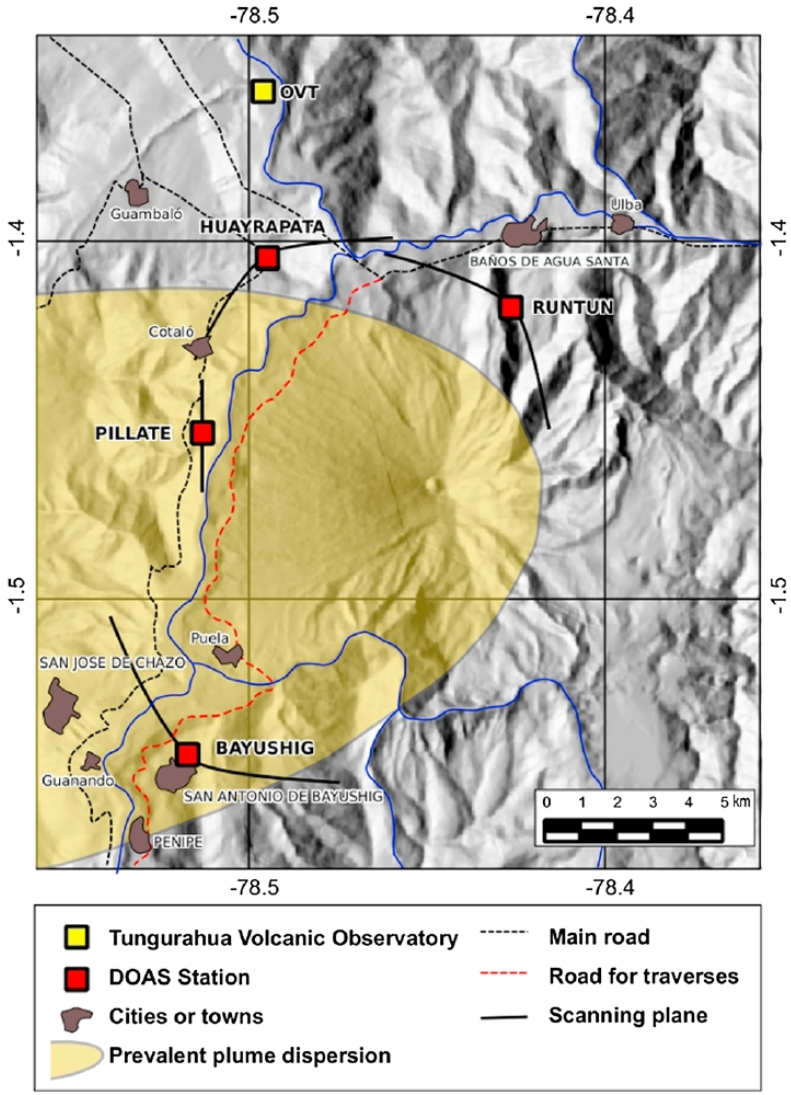
- Increase if the SO2 column densities of: 84%
  - PILLATE: 62%
  - HUAYRAPATE: 122%
  - BAYUSHIG: 23% (very view data)
- More Data relative to the NOVAC-Evaluation: 206%



[a]Fit uses only data where SO2 column density is higher than $7 \cdot 10^{17} \frac{molec}{cm^2}$

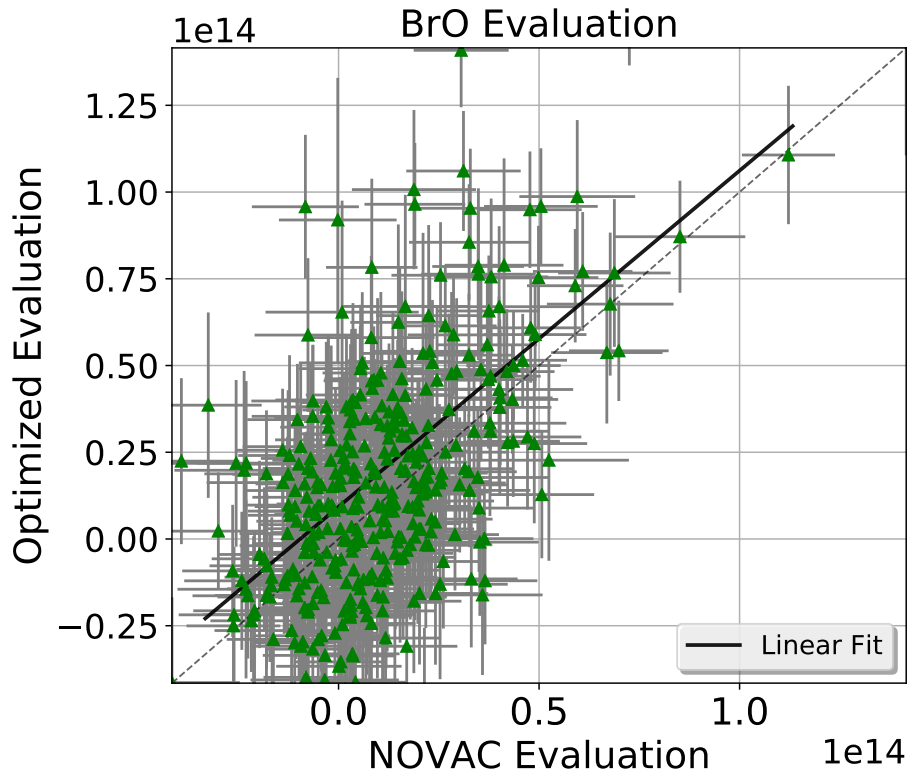
BrO Evalutaion

- Instrument PILLATE
  - Increase of BrO column density: 30%
- Instrument HUAYRAPATE
  - Increase of BrO column density: 87%
- Instrument BAYUSHIG (very view data)
  - Increase of BrO column density: 35%



BrO Evaluation

- Increase of BrO column density: 52%
- Factor the absolute error increases relative to the NOVAC-evaluation: 1.65
- Factor the relative error increases relative to the optimal-results: 1.5



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[a] Fit uses only data where SO2 column density is higher than $7 \cdot 10^{17} \frac{molec}{cm^2}$

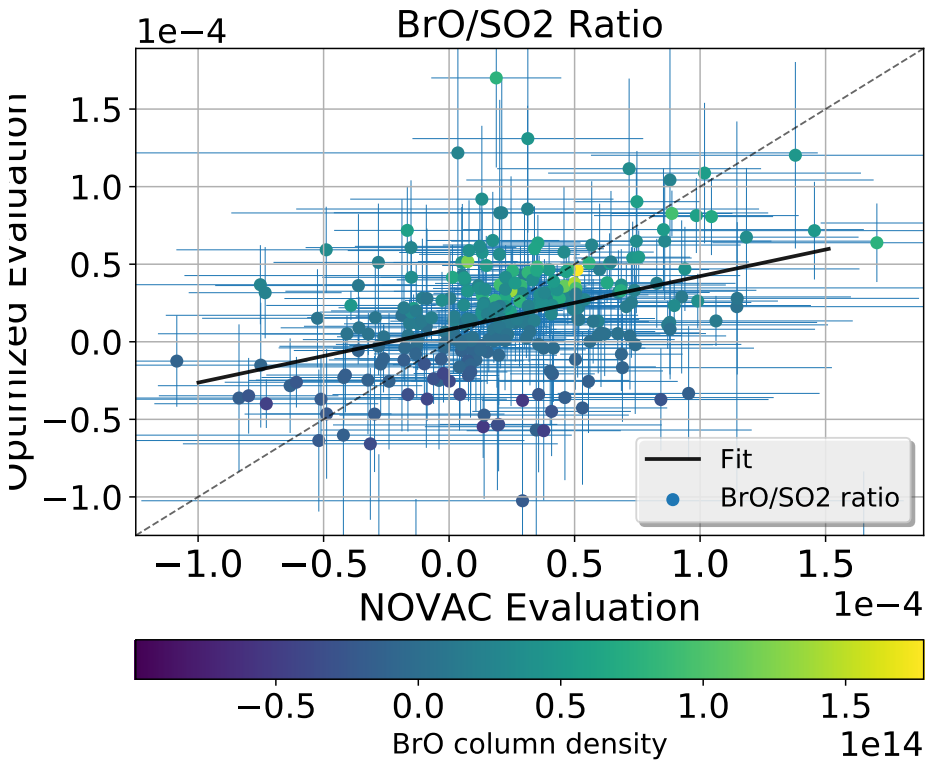
Other Methods

		Error	Amount of Data	valid data
All Variables	independent dependent	1.51 1.40	95% 98%	10,5% 8%
Exposure Time	independent All	1.47 1.39	97% 98%	10% 7%
Exp.Time u Coloridx	independent All	1.40 1.35	98% 98%	11 7%

- In the optimal results are 15% valid data

Ratio Evaluation

- Decrease of gas ratio: 25%
  - PILLATE: 32%
  - HUAYRAPATE: 12%
  - BAYUSHIG: -6%(very view data)



Total evaluation

- More BrO Data: 51%
- More valid BrO Data: 38%