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# Preliminary results for sensitivity analyses of CH4 emissions derived from ground-based synthetic observations through the TM5 4D-VAR system


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# Experiment set-up

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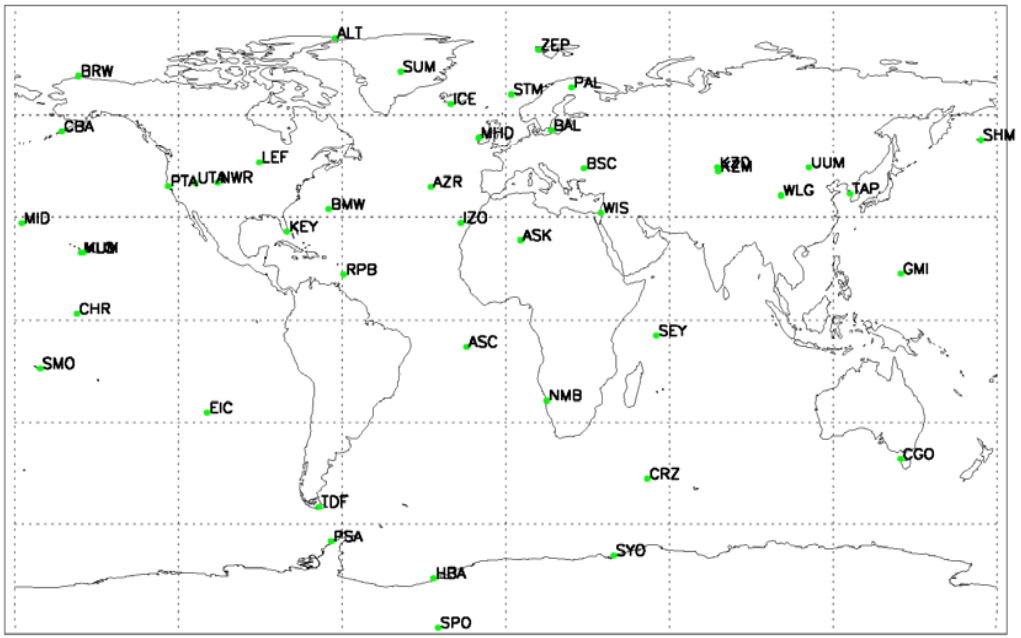
- **Use of 4D-Var system**
  - **global spatial resolution (6º by 4º)**
  - **year 2003**
  - **11 emission categories**

**Create Synthetic data ("Observations")**
- **"continuous measurements (3hr)"**

**Perturbations on emissions**
- **emissions from rice cultivation: 50% less of the true values**

STATIONS LOCATION



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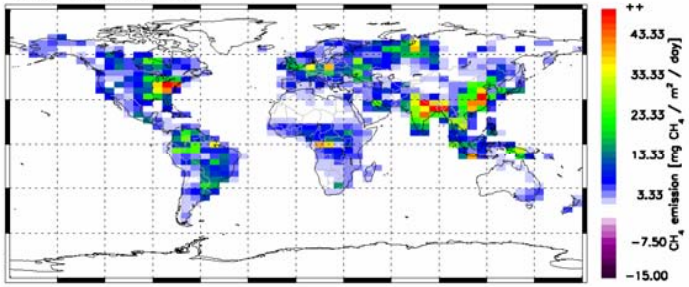
# PRELIMINARY RESULTS

## total emissions

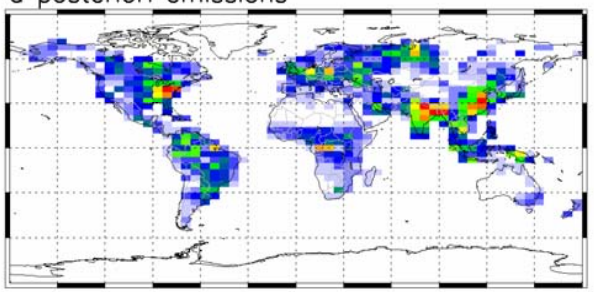
01 2003 – 12 2003

true emissions



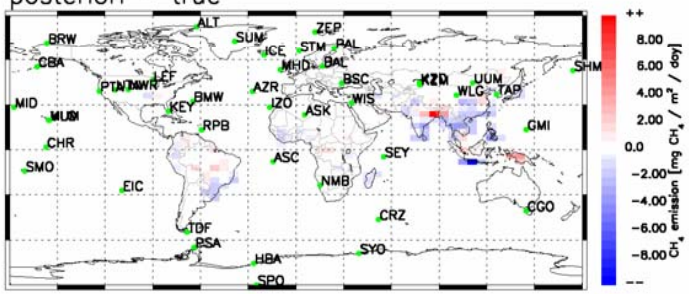

511.9 Tg $CH_4$

a posteriori emissions



510.9 Tg $CH_4$

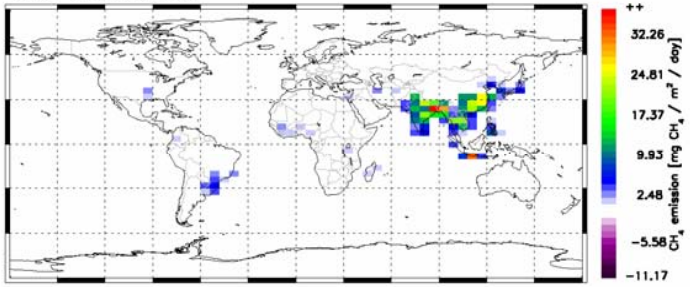
posteriori – true




## rice cultivation

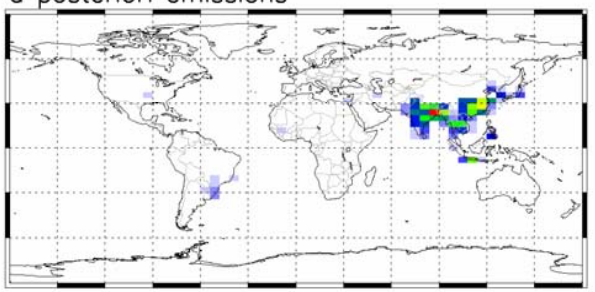
01 2003 – 12 2003

true emissions



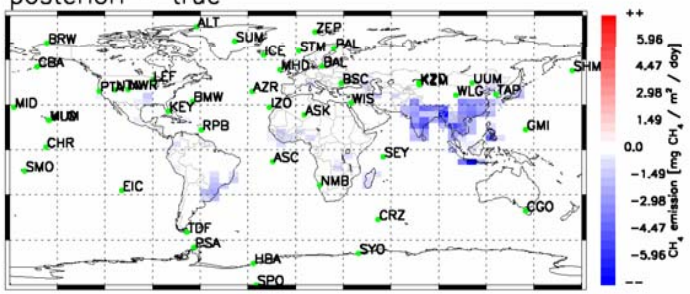

79.6 Tg $CH_4$

a posteriori emissions



59.0 Tg $CH_4$

posteriori – true



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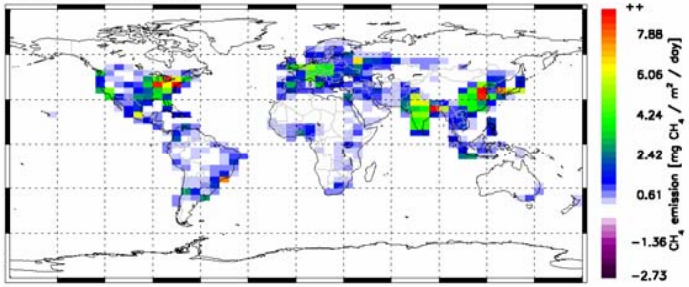
# PRELIMINARY RESULTS

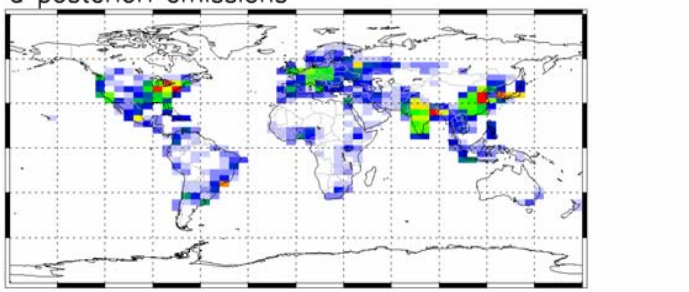
waste handling

true emissions 01 2003 – 12 2003



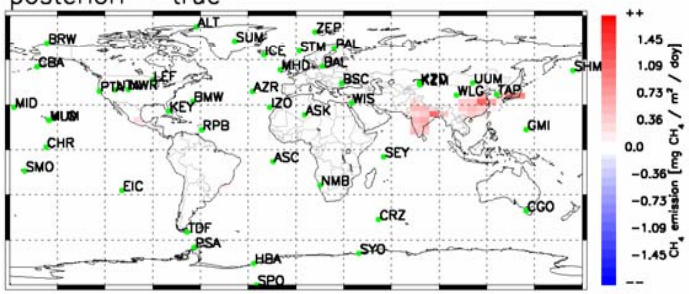

58.0 Tg $CH_4$

a posteriori emissions



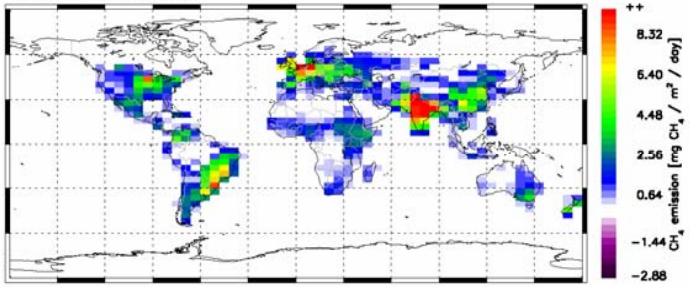
60.0 Tg $CH_4$

posteriori – true



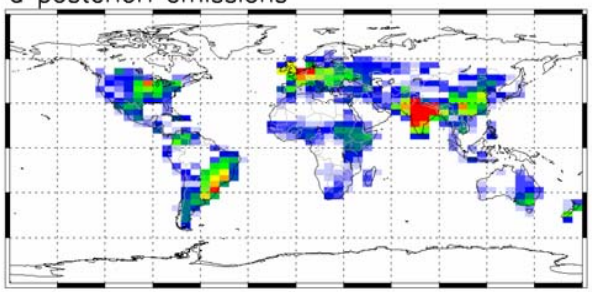

ruminants

true emissions 01 2003 – 12 2003



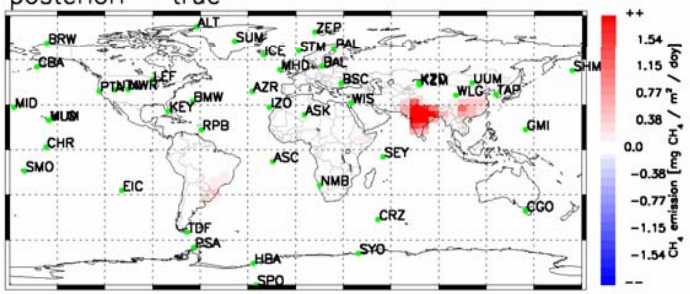

88.6 Tg $CH_4$

a posteriori emissions



93.2 Tg $CH_4$

posteriori – true



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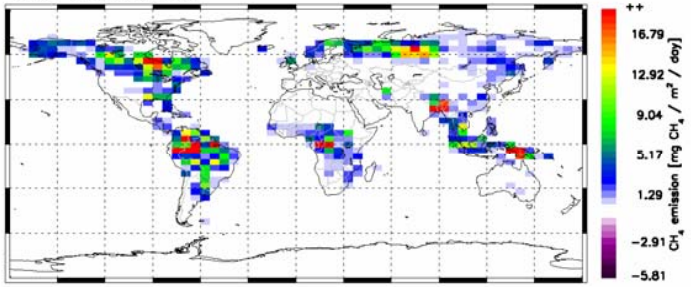
# PRELIMINARY RESULTS

wetlands

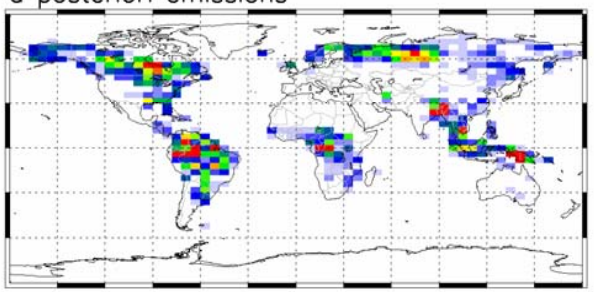
01 2003 – 12 2003

true emissions



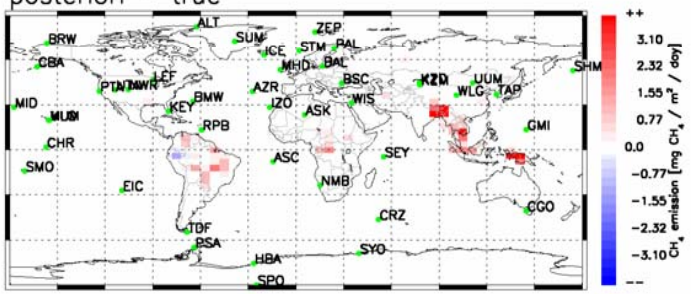

149.7 Tg $CH_4$

a posteriori emissions



159.5 Tg $CH_4$

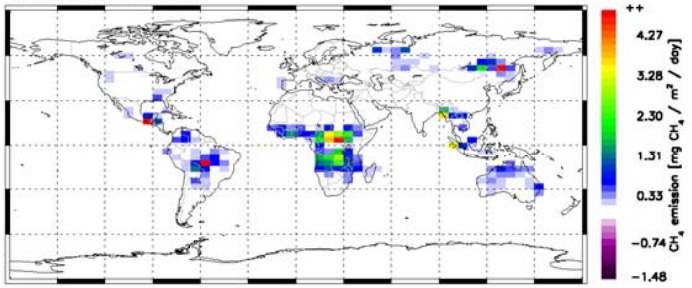
posteriori – true




biomass burning

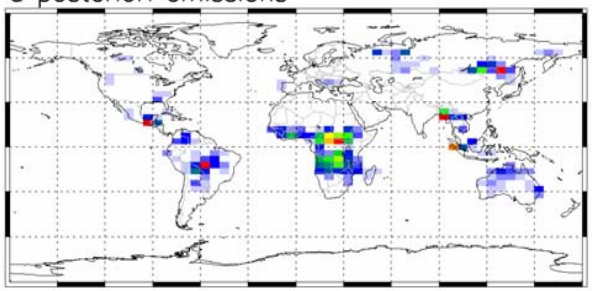
01 2003 – 12 2003

true emissions



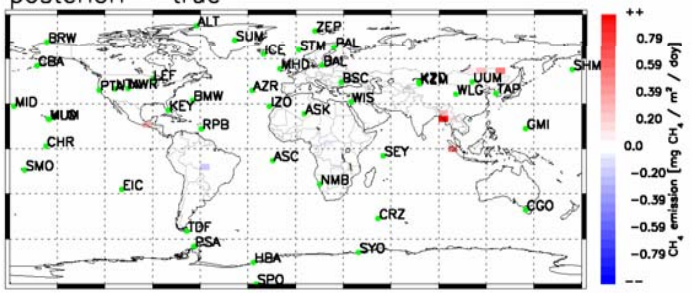

15.0 Tg $CH_4$

a posteriori emissions



15.4 Tg $CH_4$

posteriori – true



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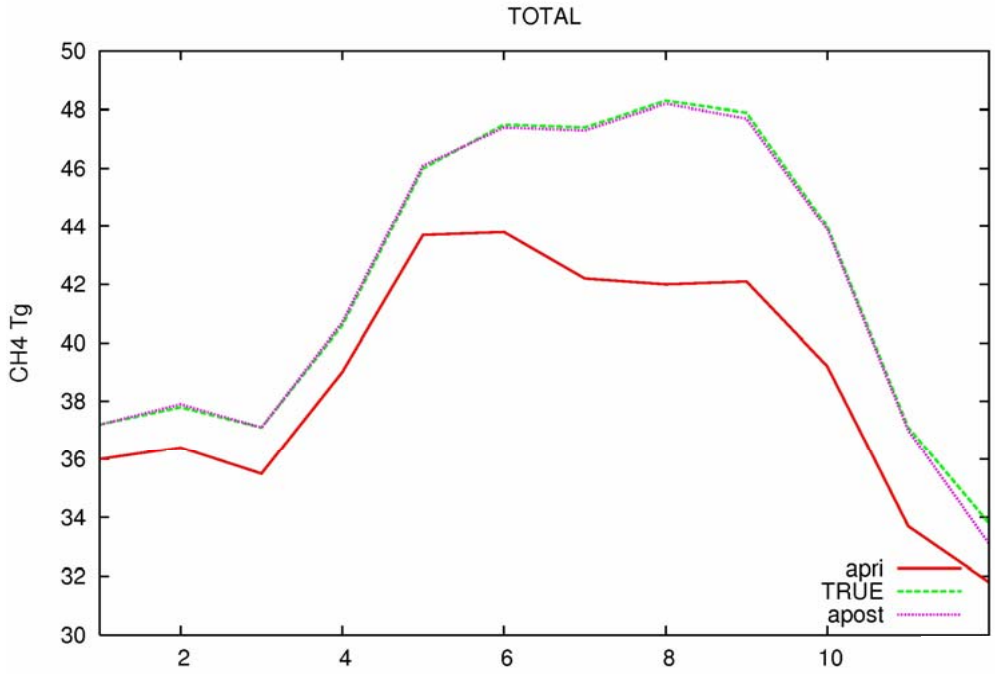
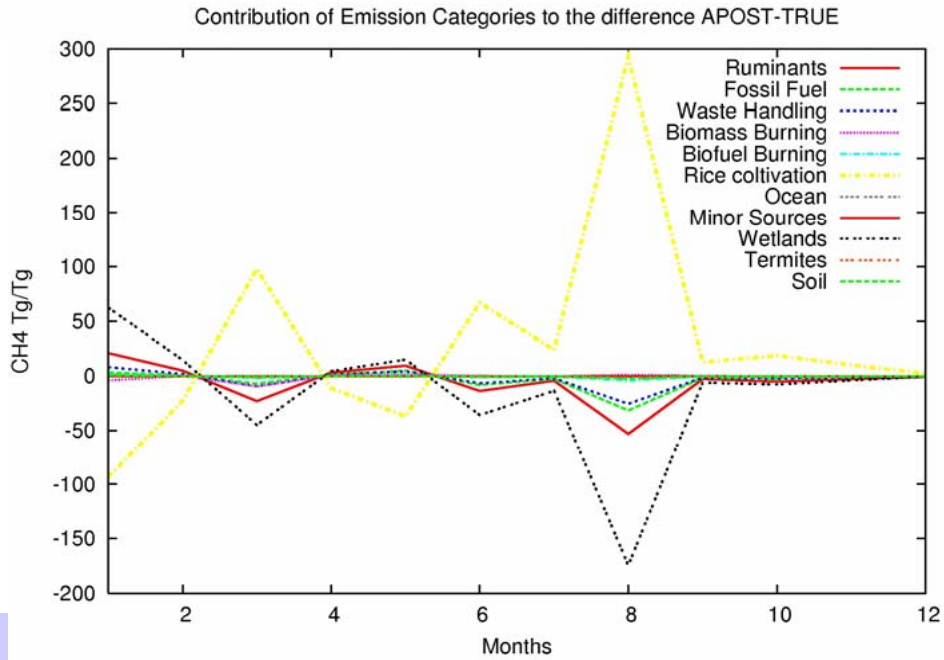
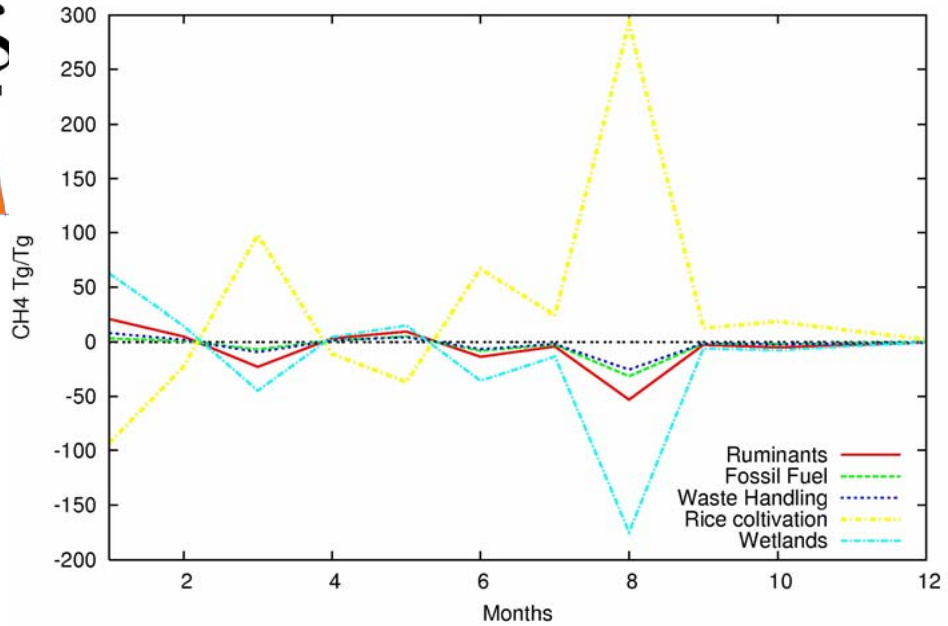
# PRELIMINARY RESULTS

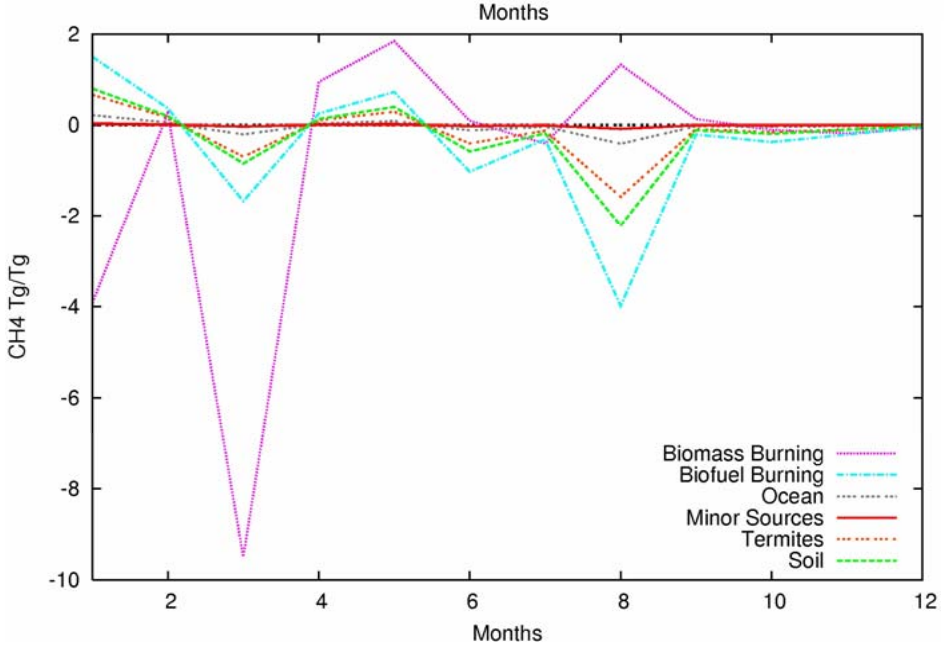



**Category contribution:**
**$(Emis_{cat_spos}-Emis_{cat_true})/(Emis_{tot_spos}-Emis_{tot_true})$**



# PRELIMINARY RESULTS




**Category contribution:**
**$(Emis_{cat_spos}-Emis_{cat_true})/(Emis_{tot_spos}-Emis_{tot_true})$**

# Conclusions

- 4D-VAR system can retrieve the CH4 “true emissions” using ground-based observations

Issues to consider for this experiment:

- Emissions attributed to categories emitting at the same location

- Emissions attributed to categories having different temporal scale correlations

Work in progress and future analyses:
- Flask measurements
- Extending the study to other emission categories

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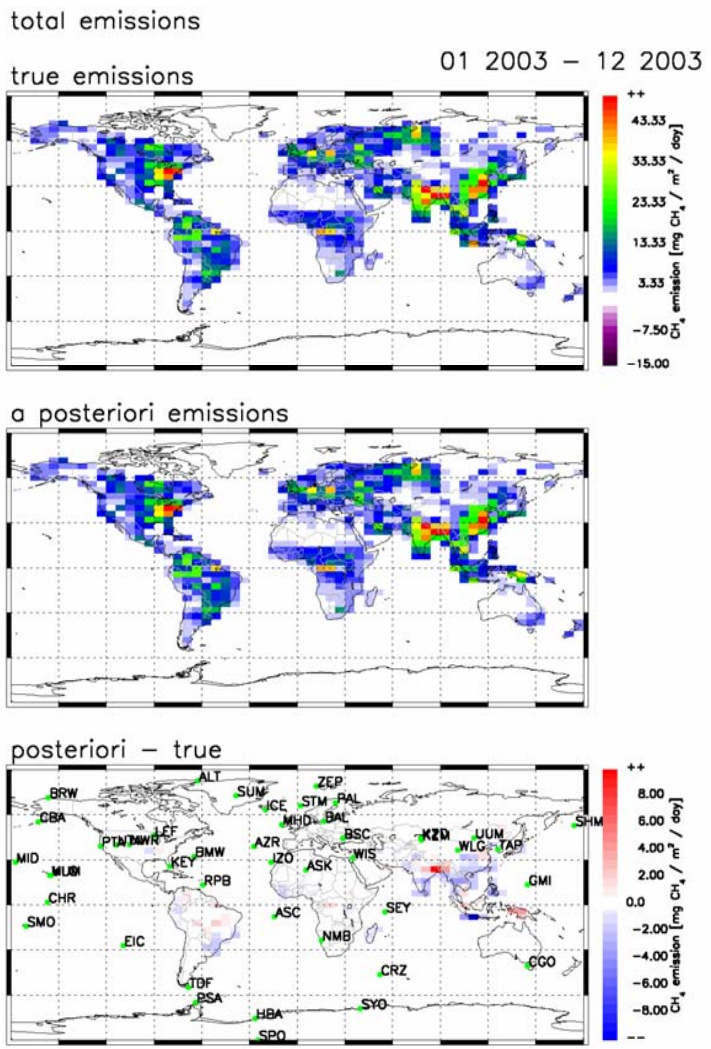
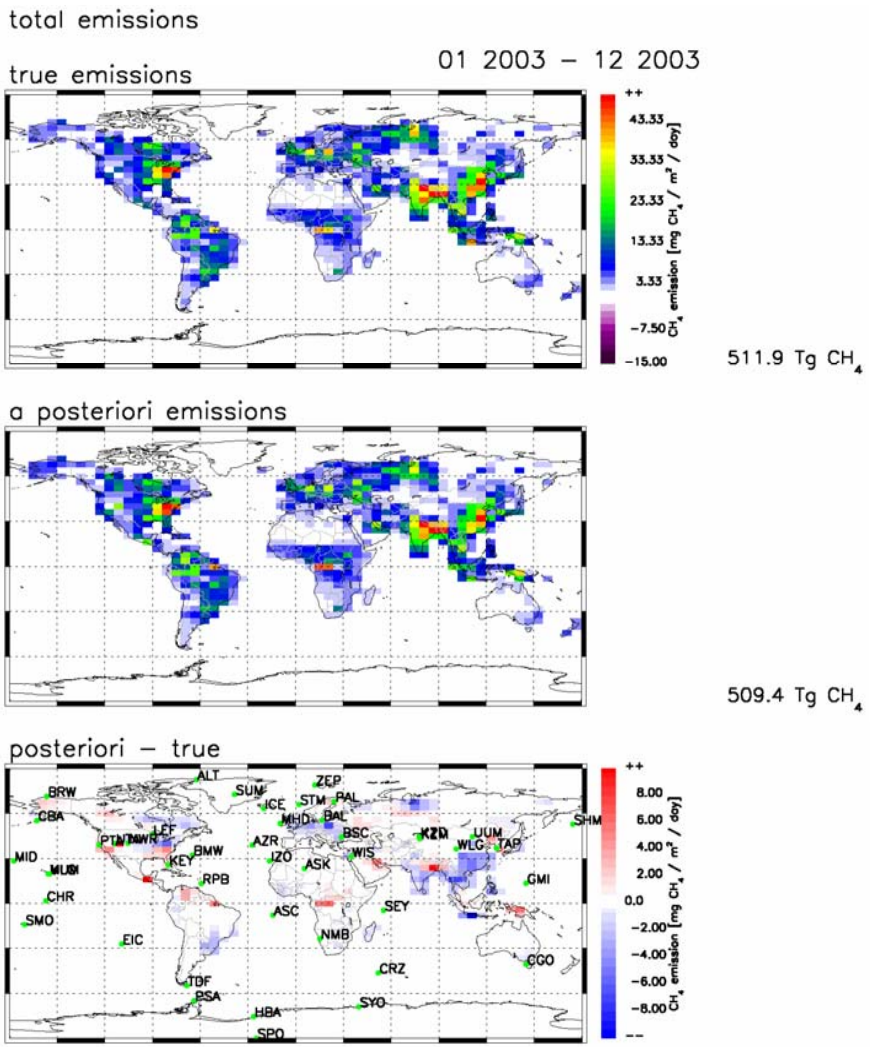
# WORK IN PROGRESS




**“Continuous Measurements”**

**“Flask Measurements”**

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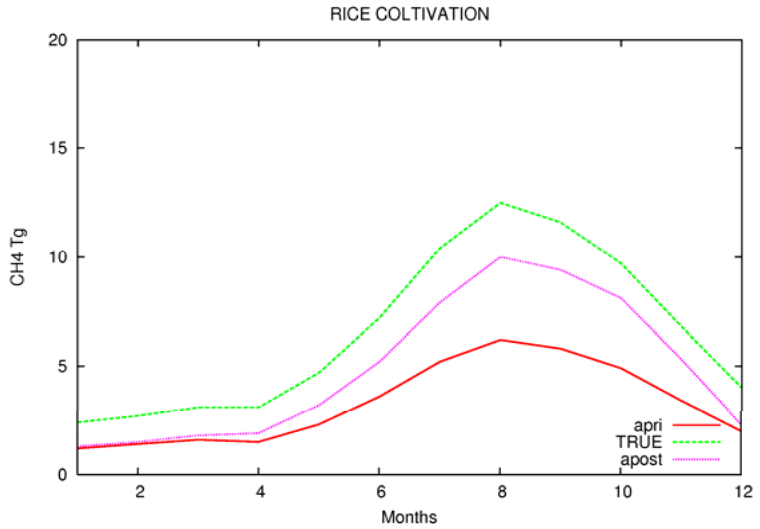
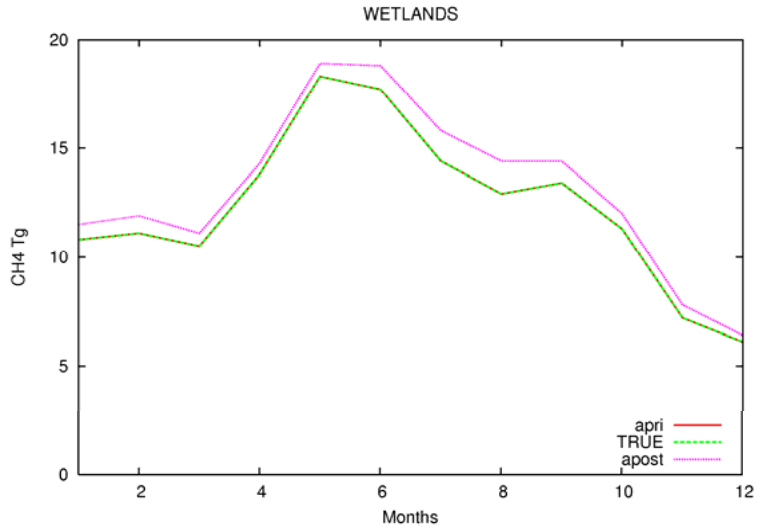
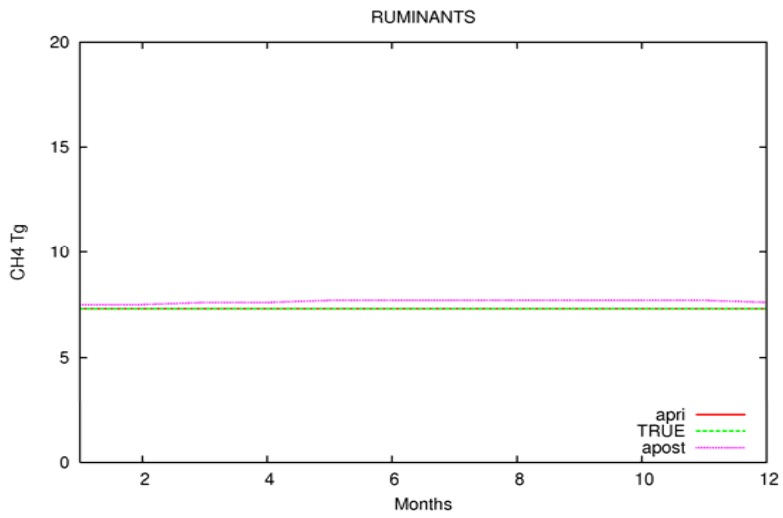
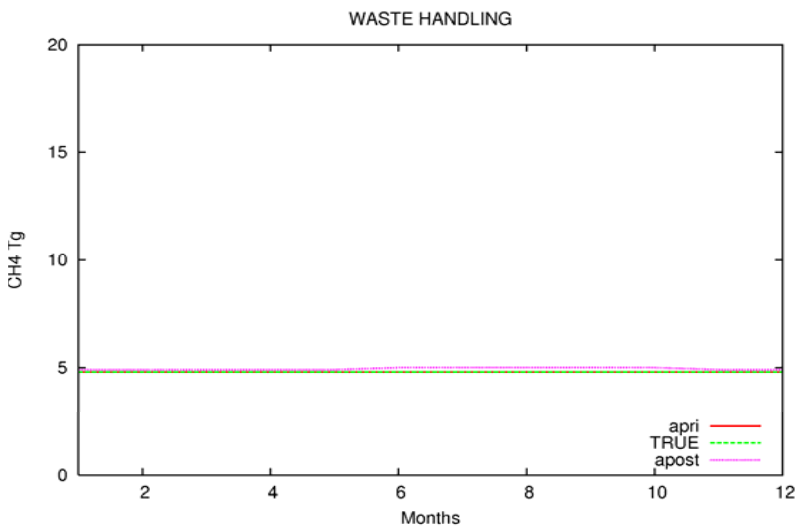
# PRELIMINARY RESULTS

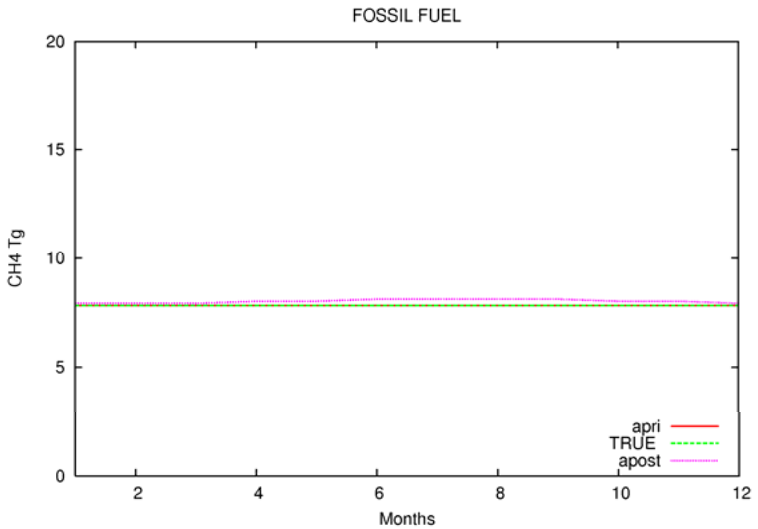


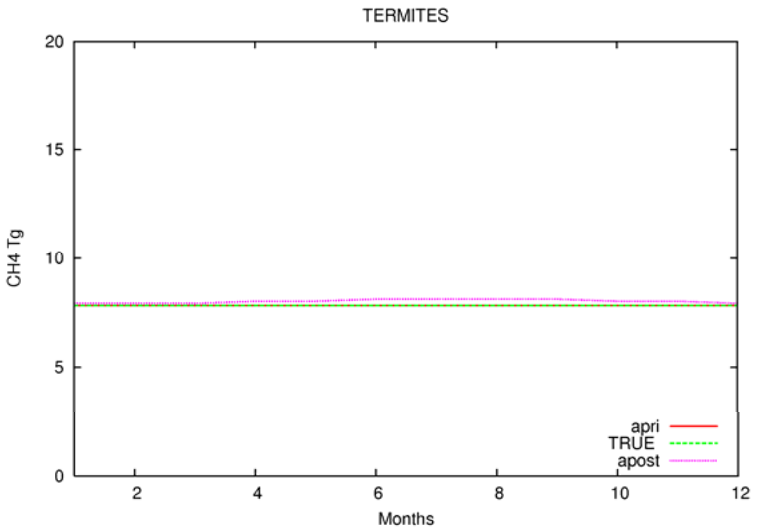



# PRELIMINARY RESULTS



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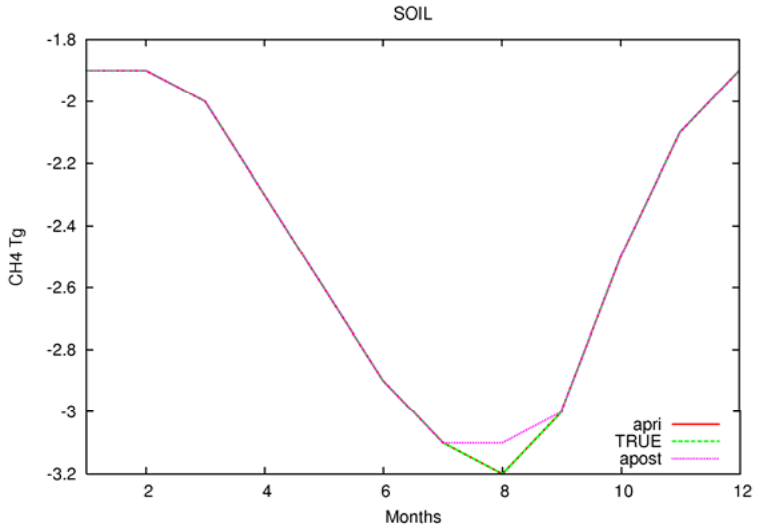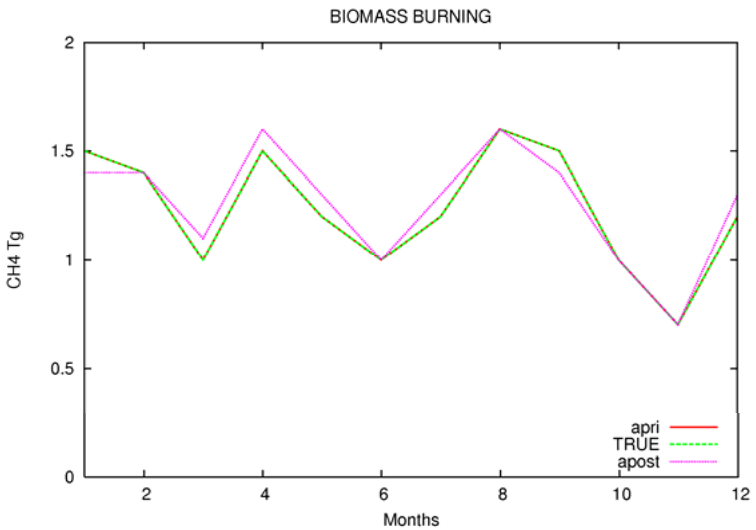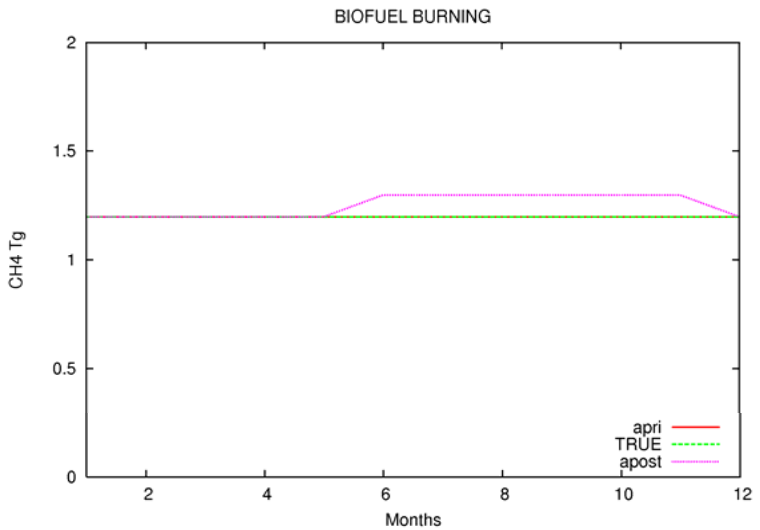
# PRELIMINARY RESULTS