

Supplementary Materials: *Comparison of XH₂O Retrieved from GOSAT Short-Wavelength Infrared Spectra with Observations from the TCCON Network*

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7 1. Brief Description

8 This document is meant as a complement to the manuscript. It includes relevant figures showing
9 the ensemble results for different coincidence criteria. During this comparison study, a large range of
10 coincidence criteria was explored; while they do not fundamentally change the conclusions given in
11 the paper, some minor differences can be noted depending on the criteria.

12 In this document, the ensemble scatter diagram, the time series and the impact of the coincidence
13 criteria on the absolute differences, as well as the altitude dependence of the relative differences are
14 shown for TANSO-FTS scans acquired within $\pm 0.5^\circ$, $\pm 1^\circ$ and $\pm 2^\circ$ in latitude and longitude of the
15 TCCON sites and the average of TCCON soundings acquired within ± 10 min, ± 30 min, ± 1 h and
16 ± 2 h of the corresponding GOSAT overpasses. For temporal coincidences of ± 2 h, there are a few
17 coincidences for TANSO-FTS measurements acquired over ocean. In such cases, the corresponding
18 scatter plots are adjoined to the ensemble scatter diagram.

19 Note that the nominal results are presented in the paper (for criteria of ± 30 min and $\pm 1^\circ$) and
20 are not reproduced in this document. Furthermore, for compacity purposes, the detailed results at
21 each TCCON site are not included here. However, the corresponding author can provide the relevant
22 figures following a simple request at the e-mail address indicated in the paper.

23 The statistical analysis results: absolute and relative mean differences and standard deviations,
24 linear regression parameters and correlation coefficients, were uploaded at the same time in a single
25 Microsoft Excel file.

26 **2. Results for criteria of $\pm 0.5^\circ$ in latitude/longitude and ± 10 min**

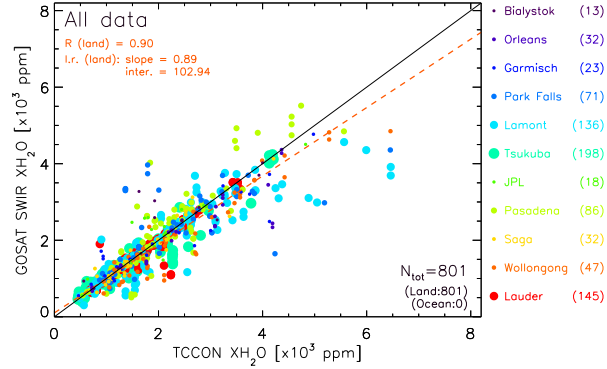


Figure S1. Comparison of TANSO-FTS vs. TCCON XH_2O (same as Figure 4 of the manuscript), for criteria of ± 10 min and $\pm 0.5^\circ$ in latitude/longitude. There are no coincidences over ocean.

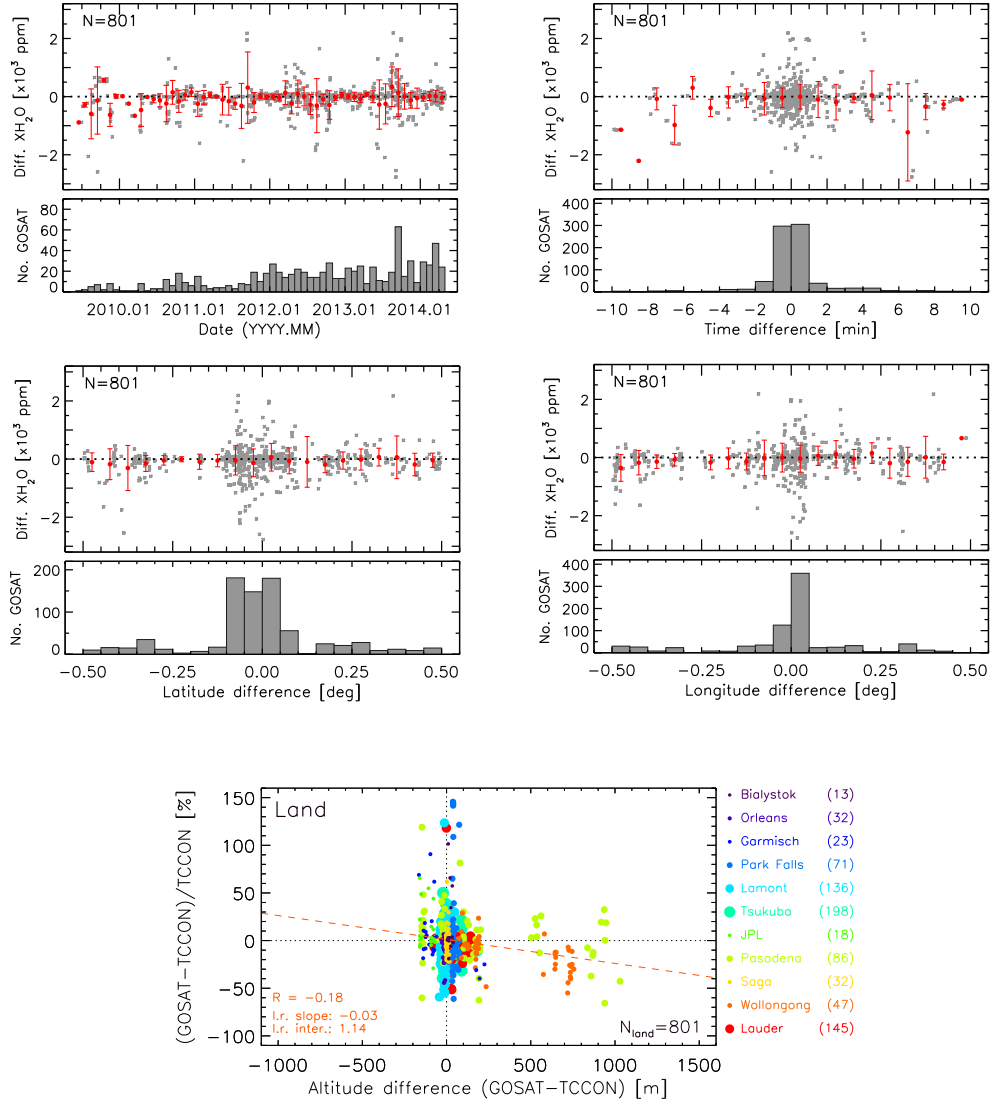


Figure S2. Evolution of the XH_2O differences (TANSO-FTS – TCCON) as a function of the collocation parameters (top four panels, same as Figure 8 of the manuscript) and altitude dependence (bottom panel, same as Figure 9 of the manuscript), for criteria of ± 10 min and $\pm 0.5^\circ$ in latitude/longitude.

27 **3. Results for criteria of $\pm 0.5^\circ$ in latitude/longitude and ± 30 min**

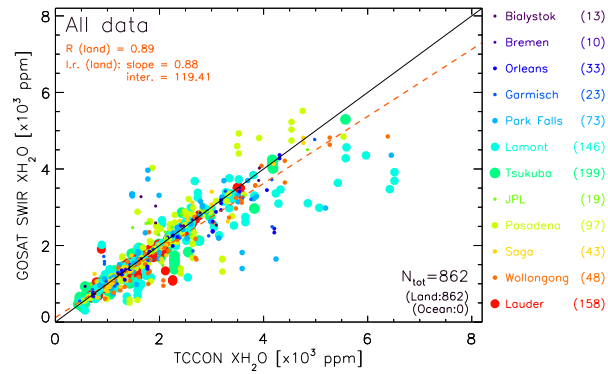


Figure S3. Same as Figure S1, but for coincidence criteria of ± 30 min and $\pm 0.5^\circ$ in latitude/longitude. There are no coincidences over ocean.

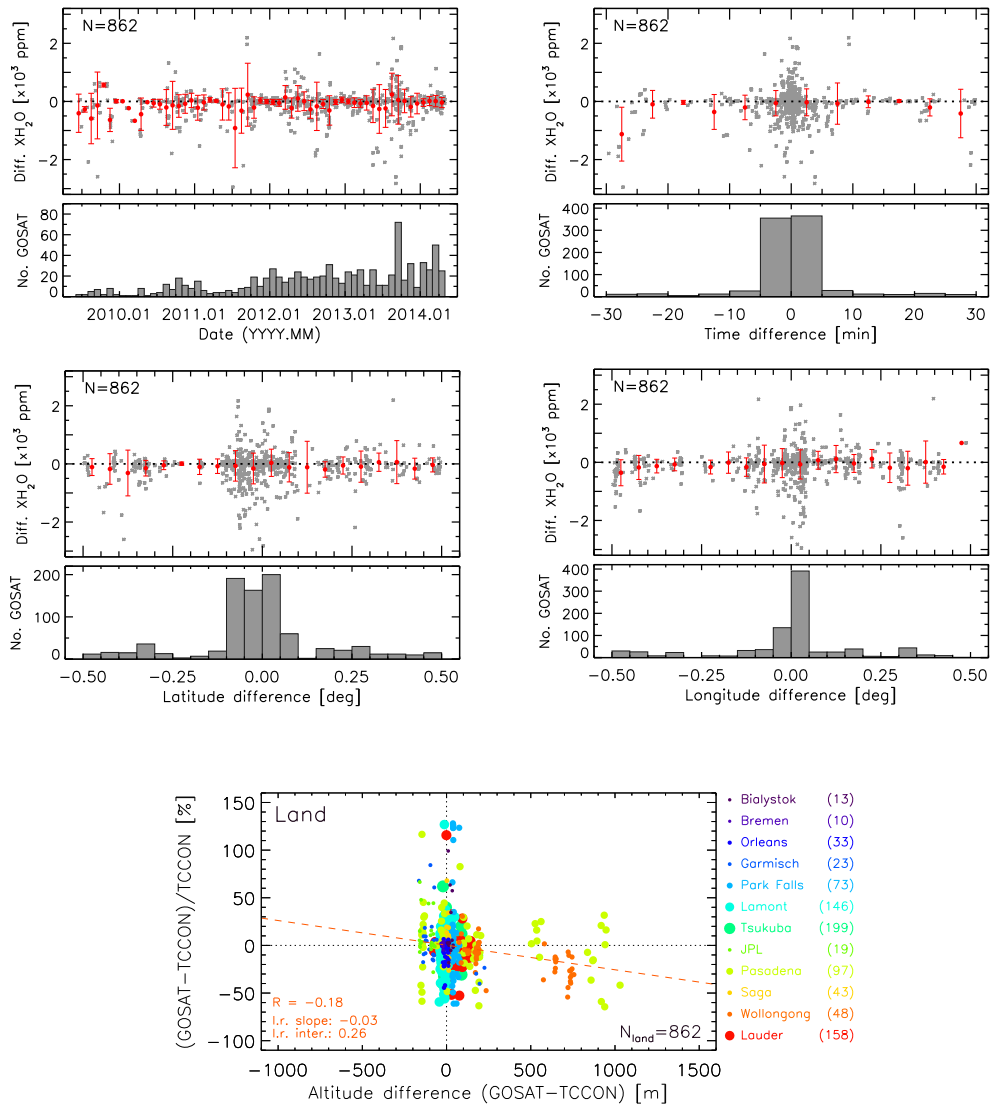


Figure S4. Same as Figure S2, but for criteria of ± 30 min and $\pm 0.5^\circ$ in latitude/longitude.

28 **4. Results for criteria of $\pm 0.5^\circ$ in latitude/longitude and ± 1 h**

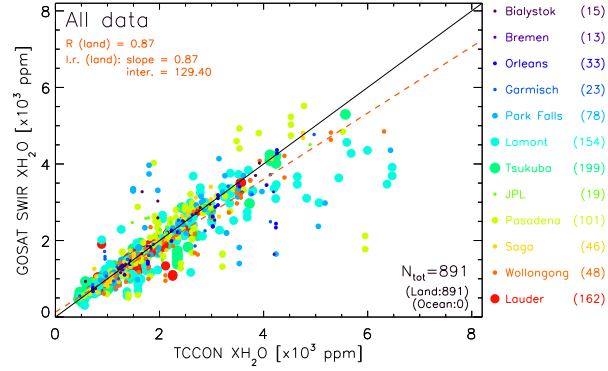


Figure S5. Same as Figure S1, but for coincidence criteria of ± 1 h and $\pm 0.5^\circ$ in latitude/longitude. There are no coincidences over ocean.

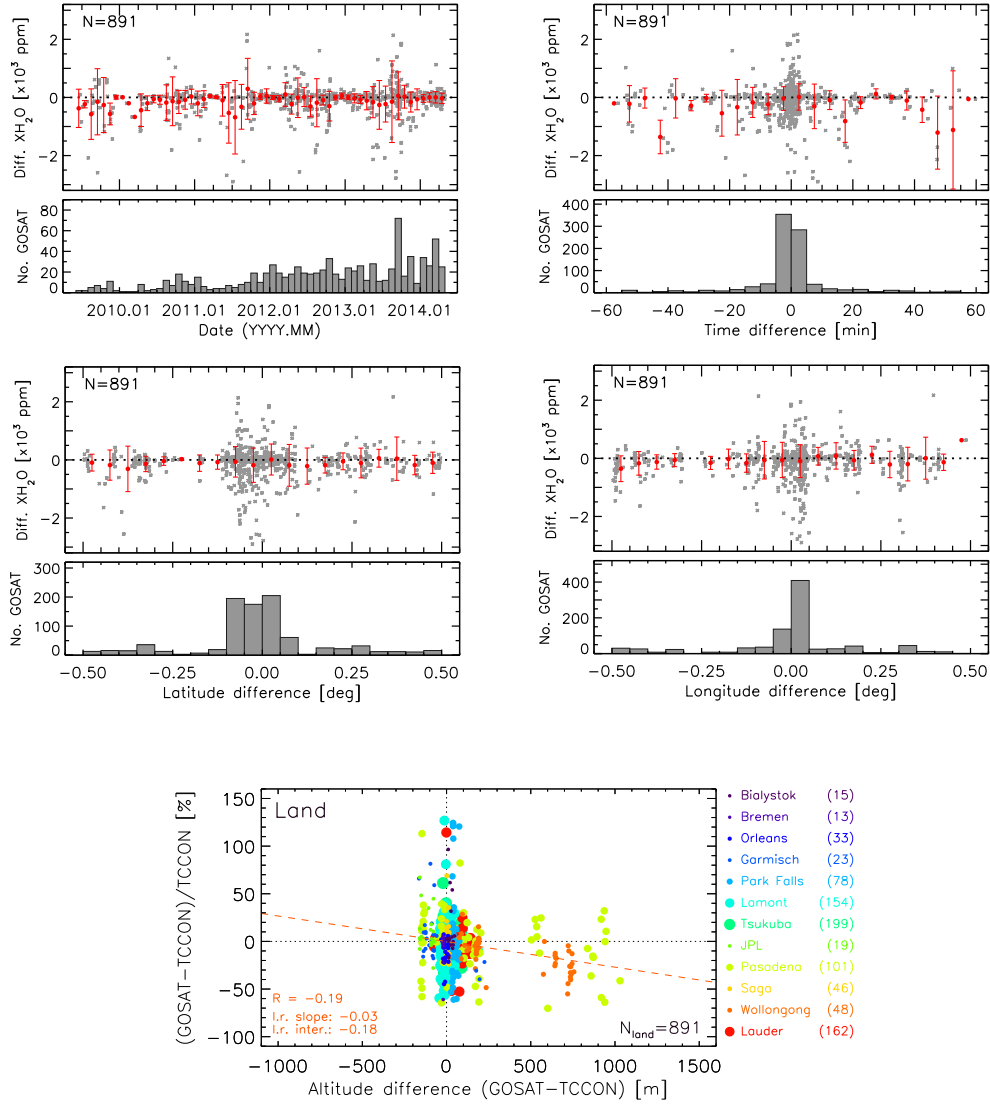


Figure S6. Same as Figure S2, but for criteria of ± 1 h and $\pm 0.5^\circ$ in latitude/longitude.

29 **5. Results for criteria of $\pm 0.5^\circ$ in latitude/longitude and ± 2 h**

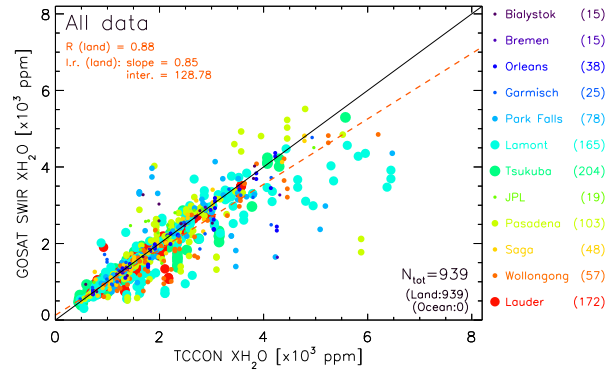


Figure S7. Same as Figure S1, but for coincidence criteria of ± 2 h and $\pm 0.5^\circ$ in latitude/longitude. There are no coincidences over ocean.

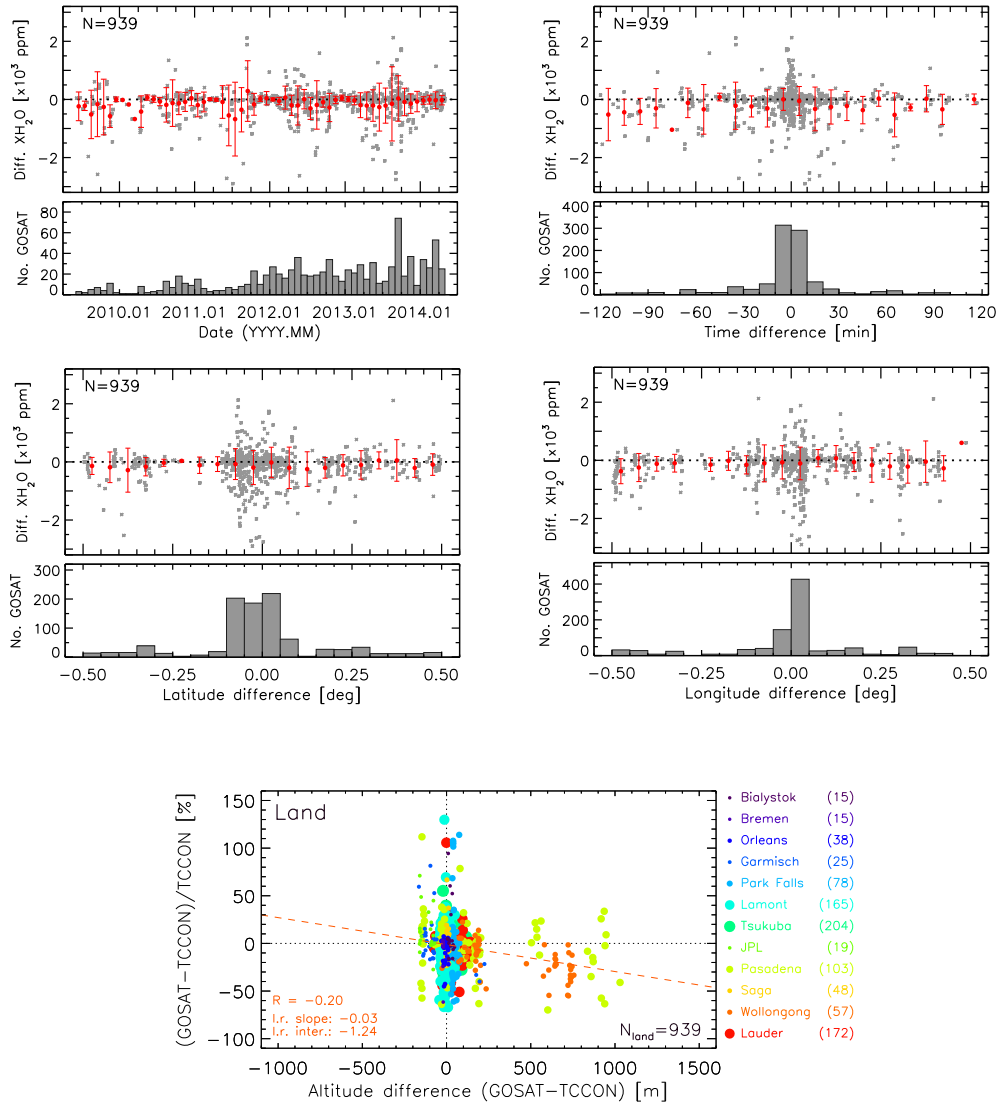


Figure S8. Same as Figure S2, but for criteria of ± 2 h and $\pm 0.5^\circ$ in latitude/longitude.

30 **6. Results for criteria of $\pm 1^\circ$ in latitude/longitude and ± 10 min**

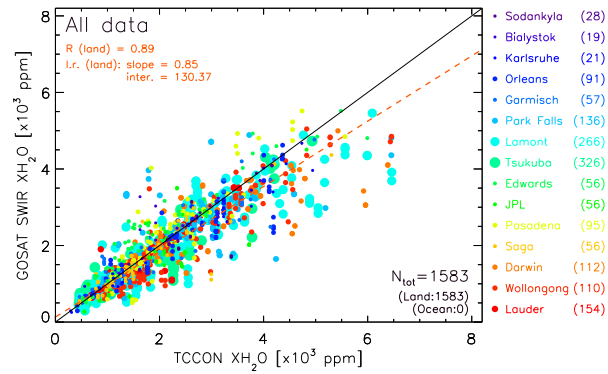


Figure S9. Same as Figure S1, but for coincidence criteria of ± 10 min and $\pm 1^\circ$ in latitude/longitude. There are no coincidences over ocean.

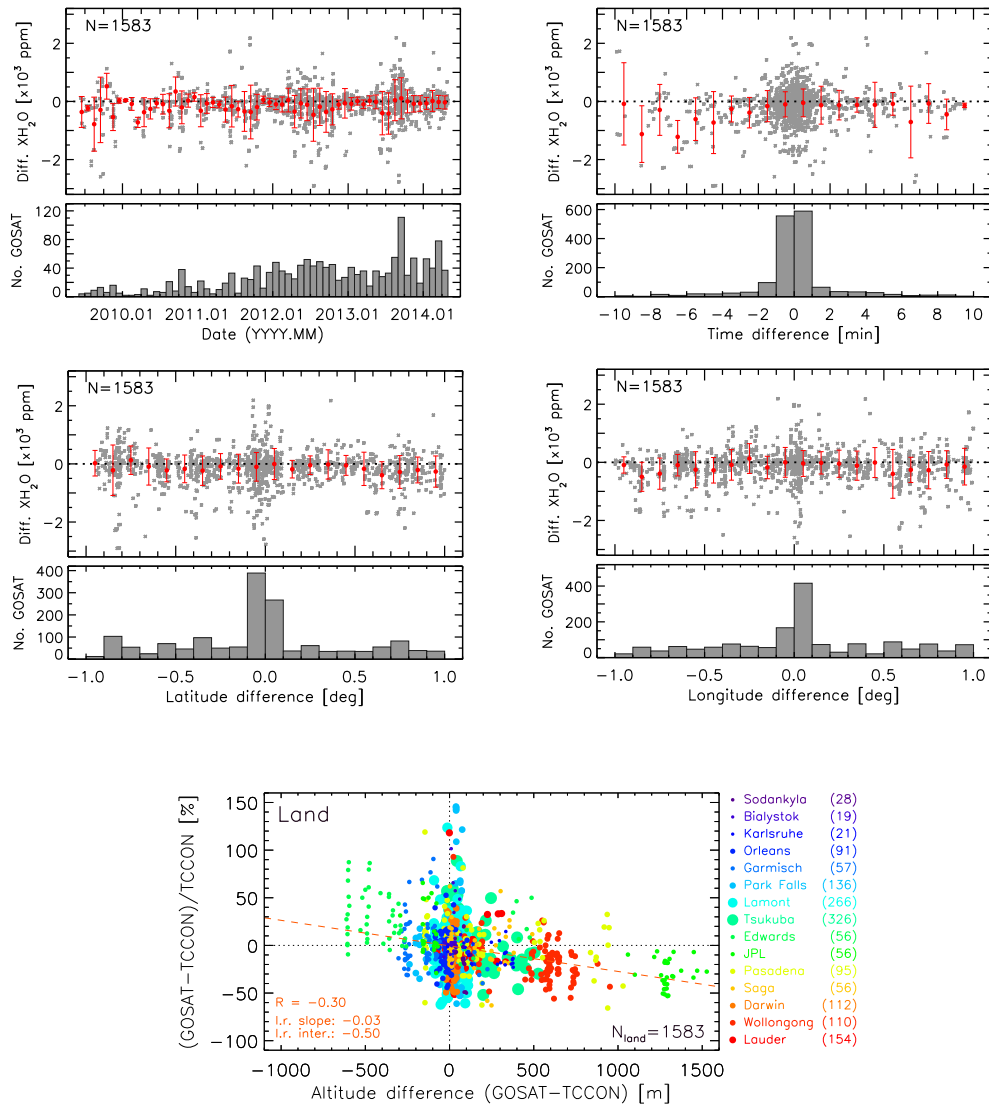


Figure S10. Same as Figure S2, but for criteria of ± 10 min and $\pm 1^\circ$ in latitude/longitude.

31 7. Results for criteria of $\pm 1^\circ$ in latitude/longitude and ± 1 h

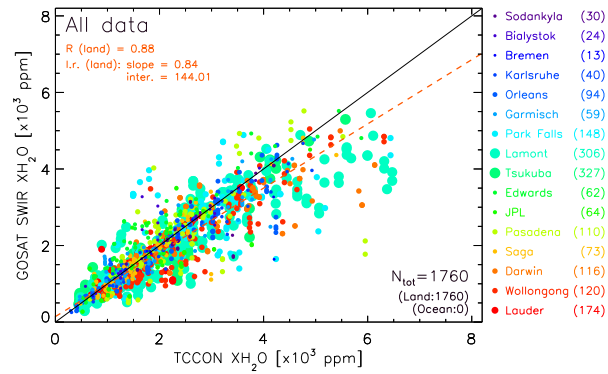


Figure S11. Same as Figure S1, but for coincidence criteria of ± 1 h and $\pm 1^\circ$ in latitude/longitude. There are no coincidences over ocean.

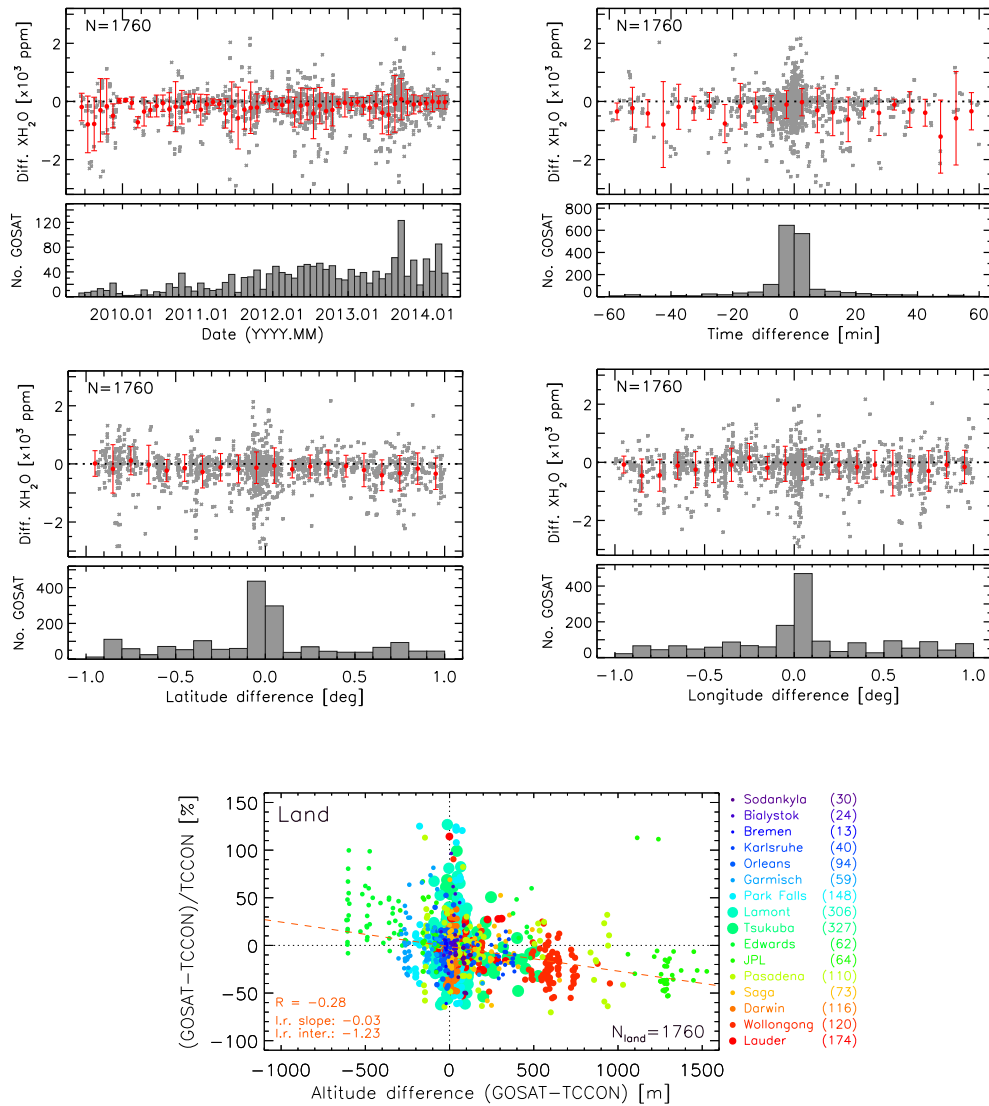


Figure S12. Same as Figure S2, but for criteria of ± 1 h and $\pm 1^\circ$ in latitude/longitude.

32 8. Results for criteria of $\pm 1^\circ$ in latitude/longitude and ± 2 h

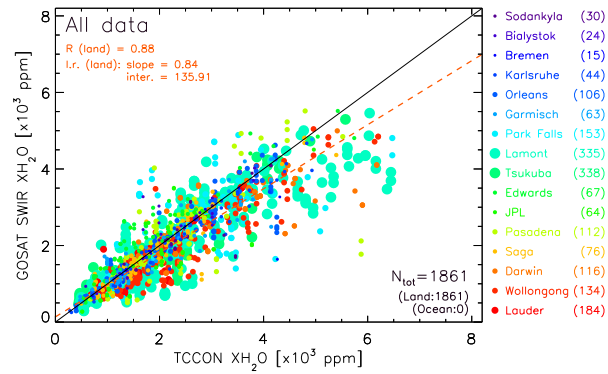


Figure S13. Same as Figure S1, but for coincidence criteria of ± 2 h and $\pm 1^\circ$ in latitude/longitude. There are no coincidences over ocean.

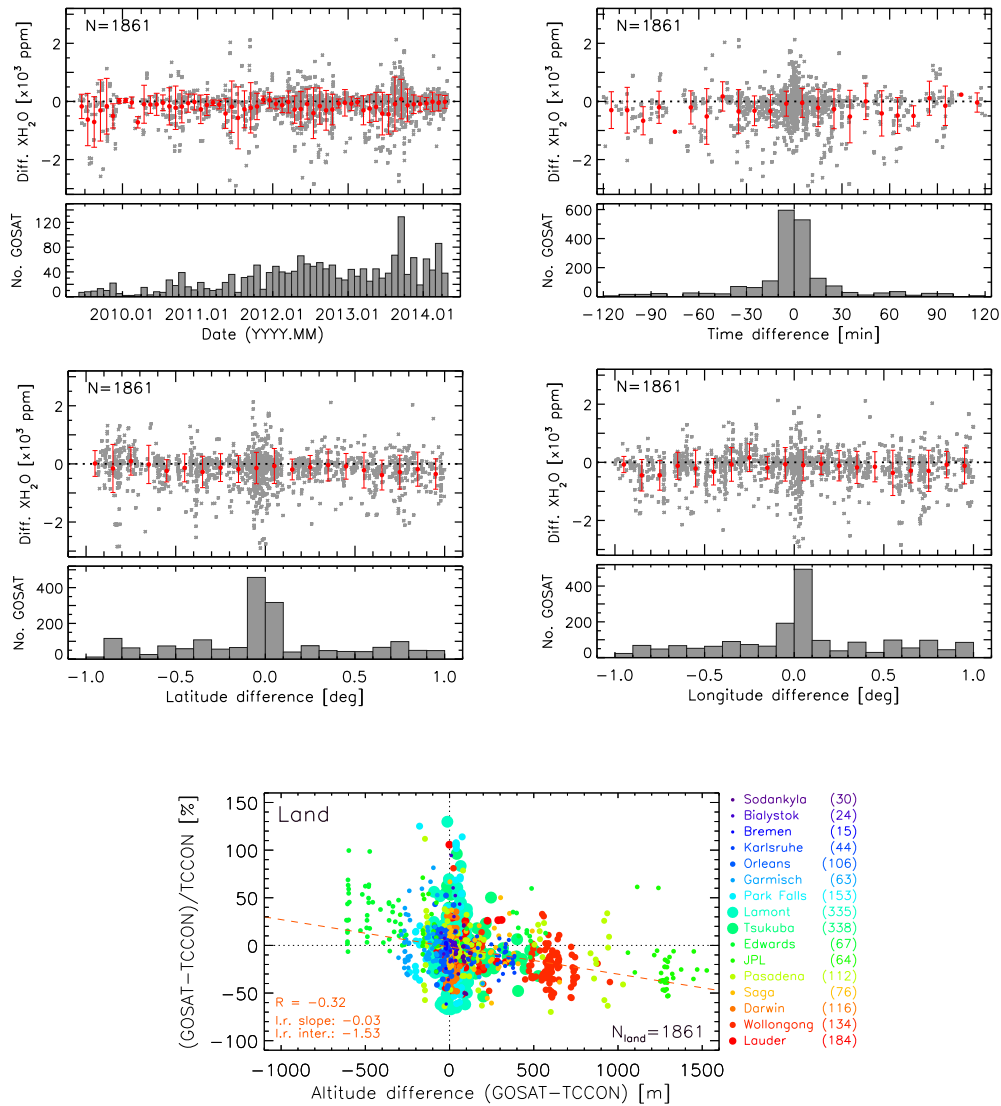


Figure S14. Same as Figure S2, but for criteria of ± 2 h and $\pm 1^\circ$ in latitude/longitude.

33 9. Results for criteria of $\pm 2^\circ$ in latitude/longitude and ± 10 min

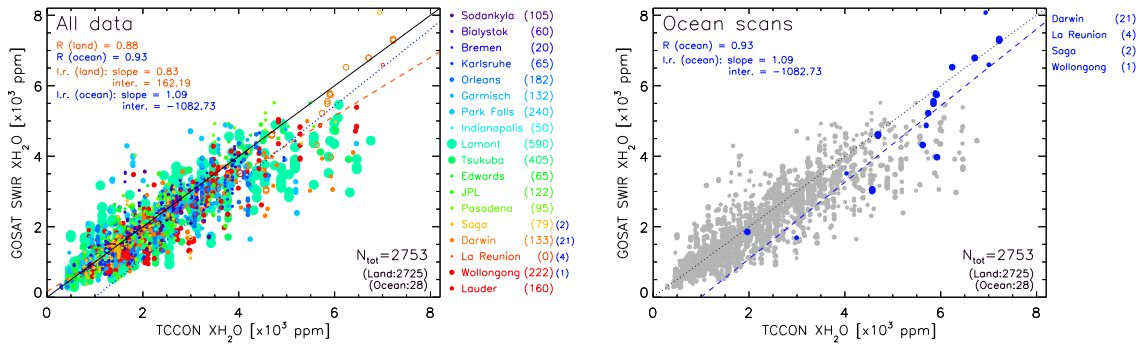


Figure S15. Left: Same as Figure S1, but for coincidence criteria of ± 10 min and $\pm 2^\circ$ in latitude/longitude. Right: focus on the ocean scans. The results over land are greyed out for clarity.

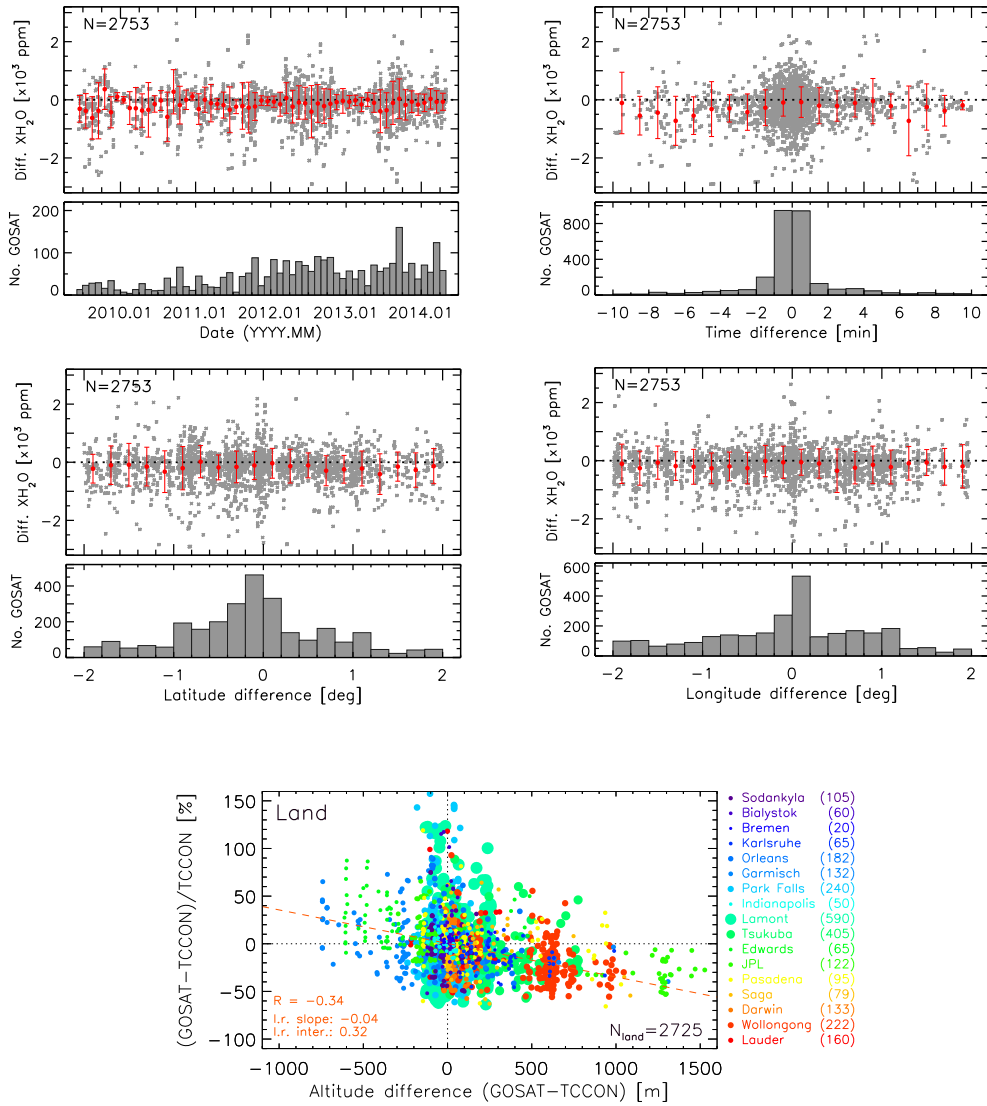


Figure S16. Same as Figure S2, but for criteria of ± 10 min and $\pm 2^\circ$ in latitude/longitude.

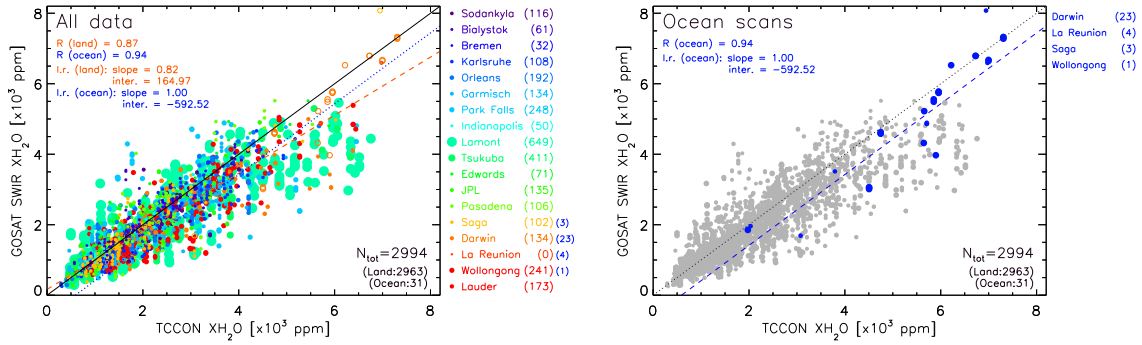
34 **10. Results for criteria of $\pm 2^\circ$ in latitude/longitude and ± 30 min**

Figure S17. Left: Same as Figure S1, but for coincidence criteria of ± 30 min and $\pm 2^\circ$ in latitude/longitude. Right: focus on the ocean scans. The results over land are greyed out for clarity.

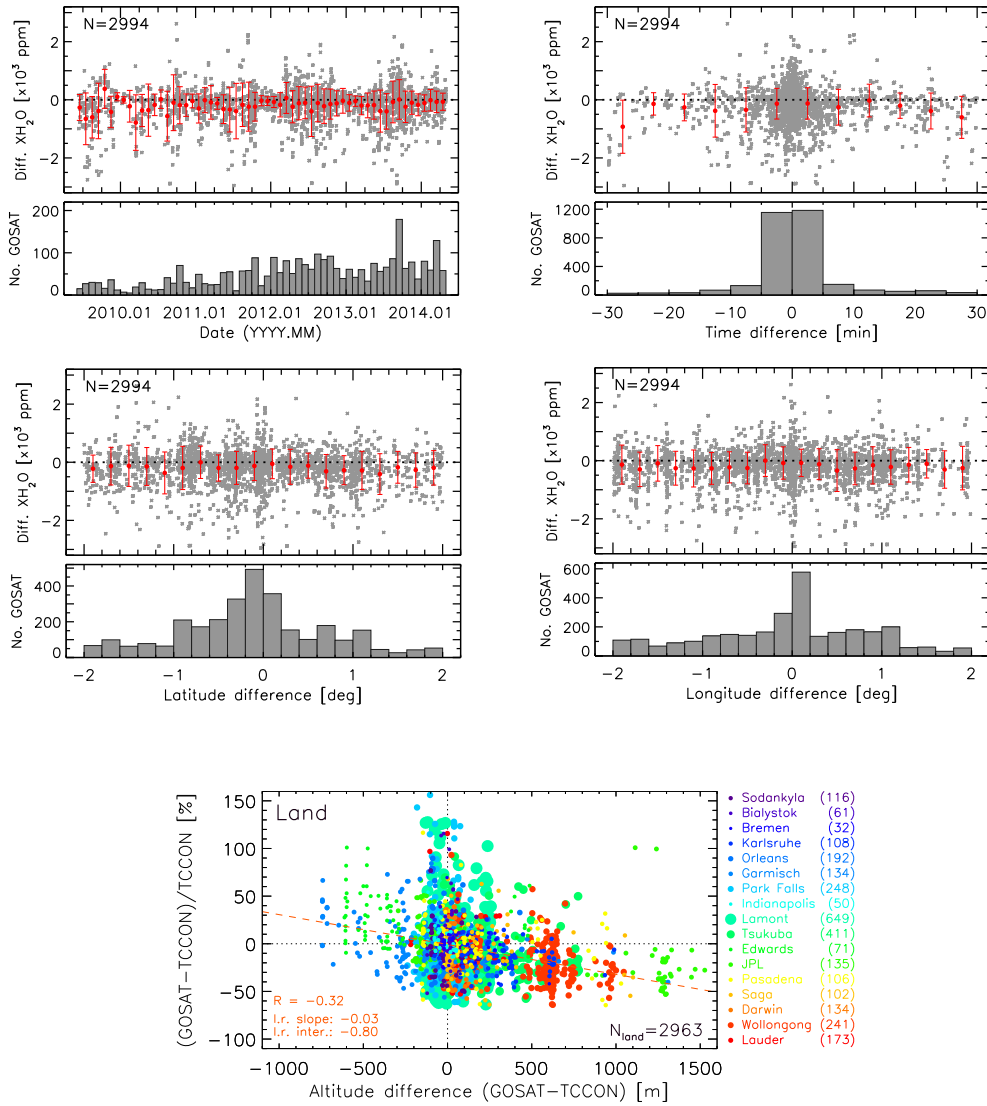


Figure S18. Same as Figure S2, but for criteria of ± 30 min and $\pm 2^\circ$ in latitude/longitude.

11. Results for criteria of $\pm 2^\circ$ in latitude/longitude and ± 1 h

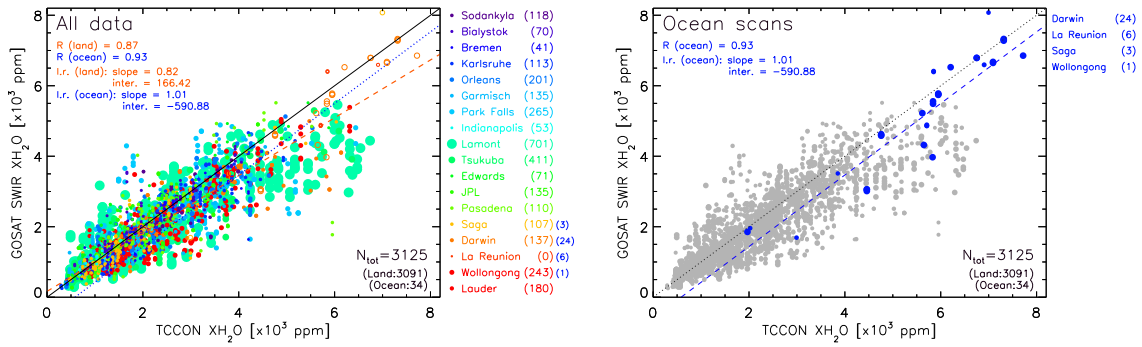


Figure S19. Left: Same as Figure S1, but for coincidence criteria of ± 1 h and $\pm 2^\circ$ in latitude/longitude. Right: focus on the ocean scans. The results over land are greyed out for clarity.

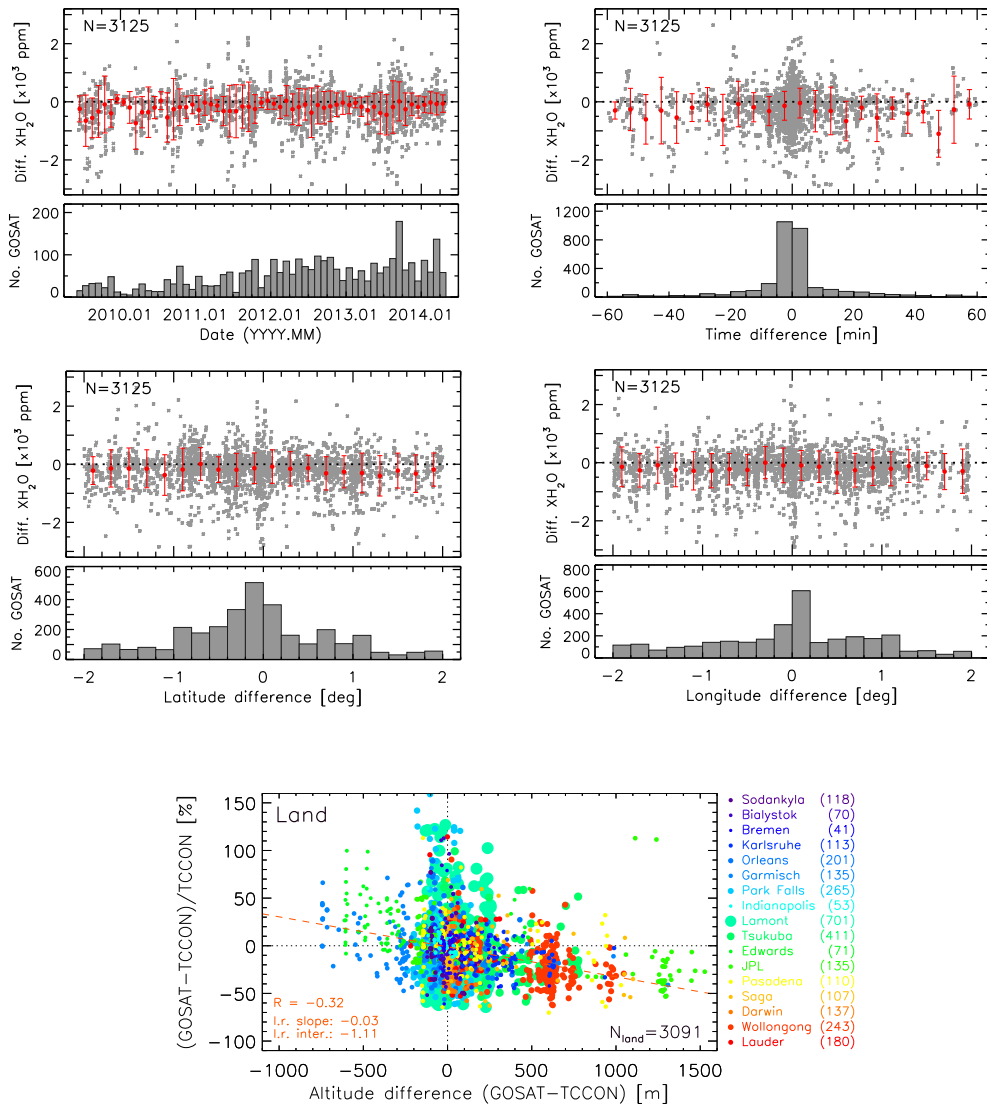


Figure S20. Same as Figure S2, but for criteria of ± 1 h and $\pm 2^\circ$ in latitude/longitude.

36 12. Results for criteria of $\pm 2^\circ$ in latitude/longitude and ± 2 h

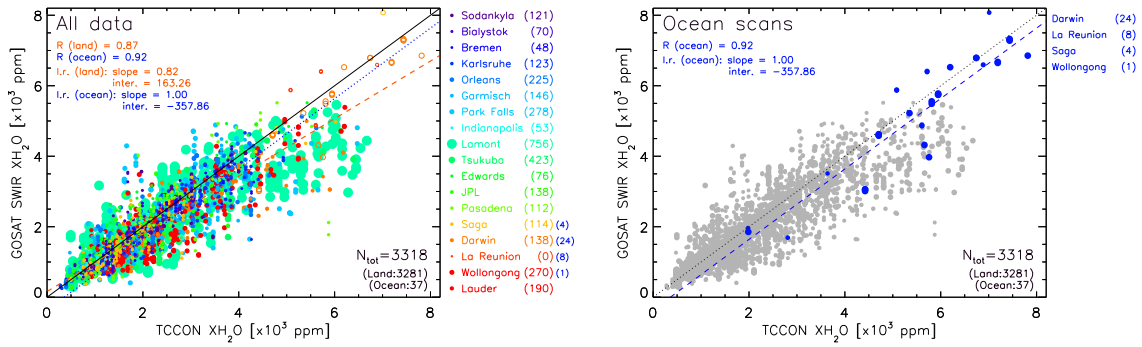


Figure S21. Left: Same as Figure S1, but for coincidence criteria of ± 2 h and $\pm 2^\circ$ in latitude/longitude. Right: focus on the ocean scans. The results over land are greyed out for clarity.

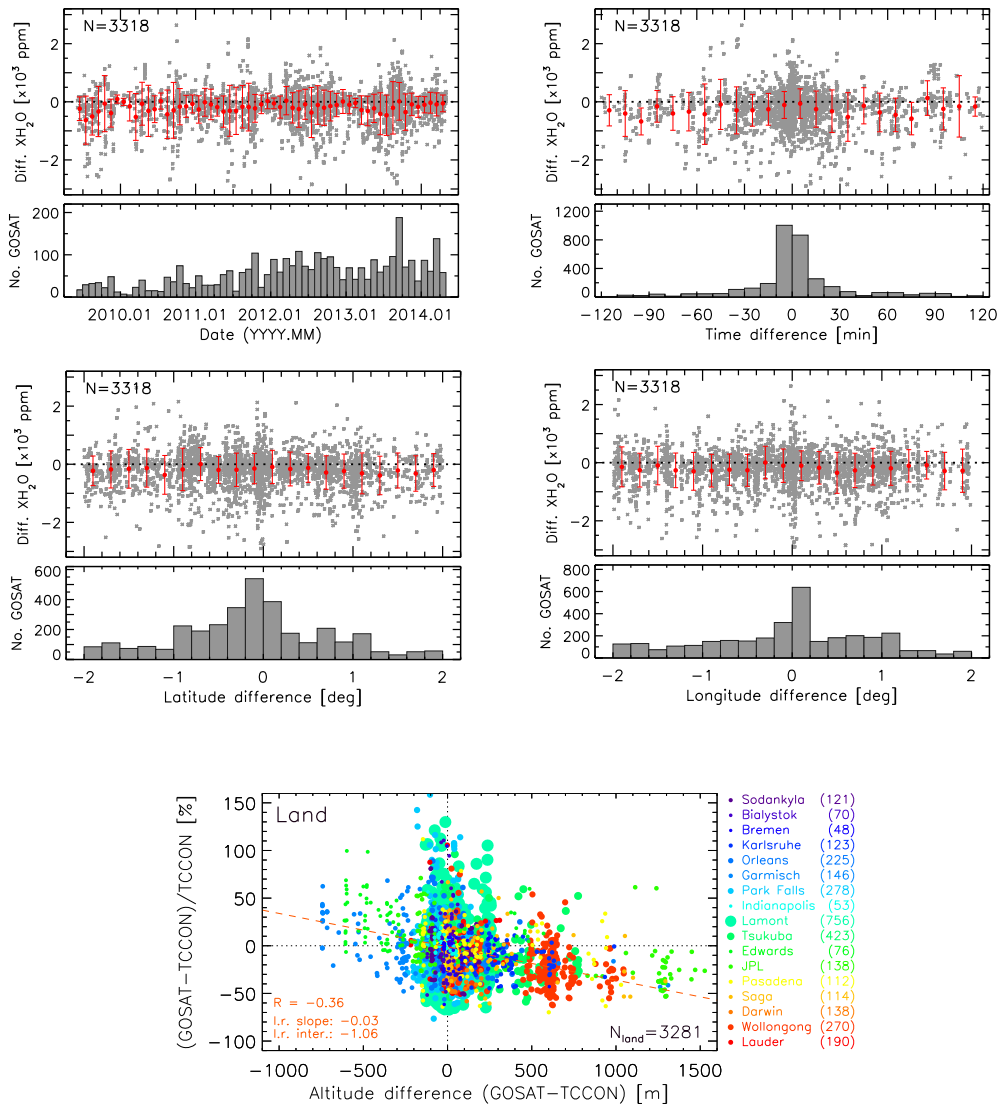


Figure S22. Same as Figure S2, but for criteria of ± 2 h and $\pm 2^\circ$ in latitude/longitude.