A Tour of Events of Interest During the TRACER Campaign

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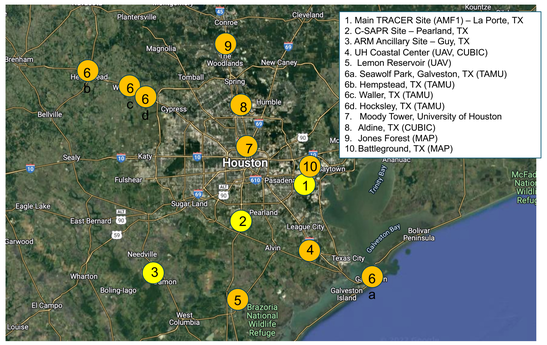
1. RESEARCH OBJECTIVES

The TRacking Aerosol Convection interactions ExpeRiment (TRACER) [1,2] was aimed at collecting a comprehensive set of measurements of convective cloud microphysics, environmental thermodynamics and aerosol chemical and physical properties that will be combined with ensembles of state-of-the-art cloud-resolving model simulations to address uncertainties in our understanding of aerosol-convection interactions and the underlying cloud and aerosol lifecycles.

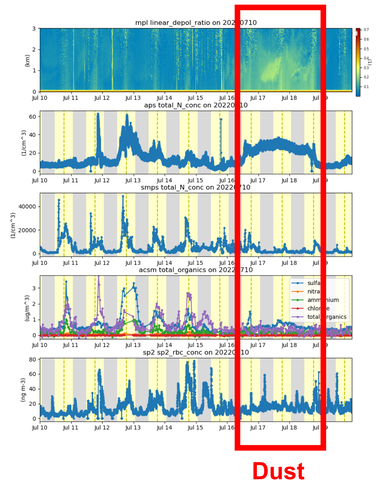
2. THE TRACER CAMPAIGN

Houston, TX region
October 2021 – September 2022
June – September 2022 [Intensive Operational Period]



The humid subtropical climate and coastal urban environment of the Houston, TX region provide a significant number of isolated convective clouds with large and diverse aerosol sources providing an excellent setting for the study of aerosol-convection interactions.

3. SAHARAN DUST EVENT 07/17-18



MPL linear depolarization ratio

APS total number concentration (>500 nm)

SMPS total number concentration (10-500 nm)

ACSM aerosol mass concentrations

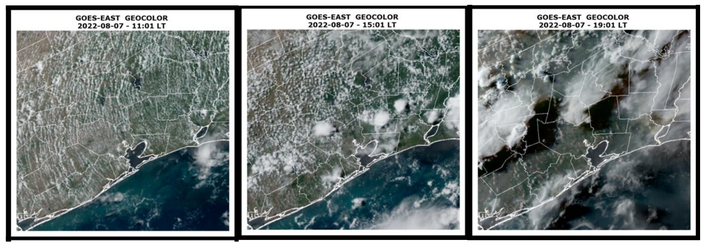
SP2 rBC mass concentration

Dust

4. CONVECTIVE CASES FOR MODELLING STUDIES [3,4]

Date	Description
02 Jun	Numerous isolated cells, synoptic influence lacking sea breeze. Mostly clean marine aerosols.
17 Jun*	Convection forced by both sea breeze and large-scale across domain. Mostly clean marine aerosols.
21 Jun	Convective clouds advected from east during late afternoon. Mostly clean marine aerosols.
07 Aug*	Isolated convection under onshore flow and deep moist layer. Polluted before sea breeze, clean marine after.
17 Sep	Isolated shallow convection with no sea breeze. Dry above 5 km. Mixed aerosol.
18 Sep	Like Sept. 17, but a discernible sea breeze develops.

* Indicates cases selected for Model Intercomparison Project

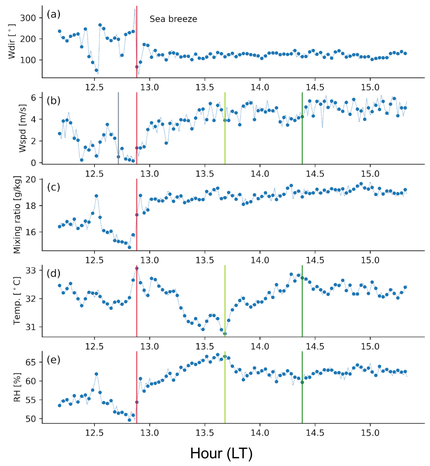


For more information see Poster #1-45 Saleeby et al.

5. SEA BREEZE EVENTS

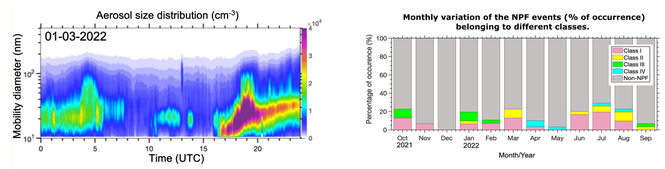
58 instances of sea breeze frontal passage at the main TRACER site have been identified [5]

Surface meteorology observations from the main TRACER site on 09 June 2022



For more information see Poster #4-16 Deng et al.

6. NEW PARTICLE FORMATION EVENTS

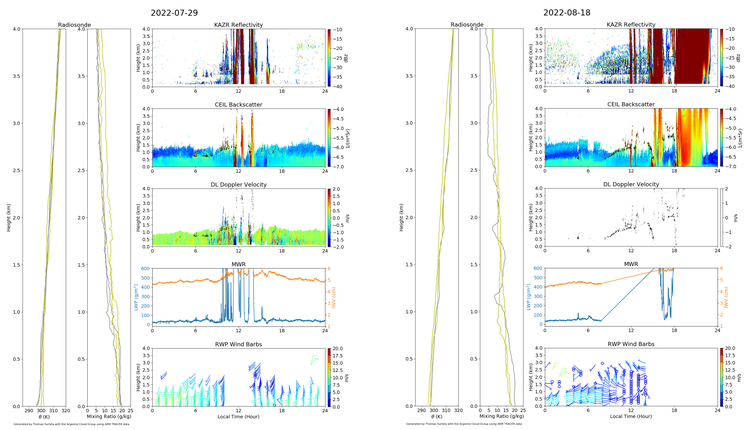


53 NPF events were identified at the main TRACER site.

Class I: Regional aerosol phenomenon: nucleation mode formation and steady growth.
Class II: Sub-regional aerosol phenomenon: appearance of nucleation mode without growth.
Class III: Sub-regional aerosol phenomenon: absence of a clear nucleation mode, but with growth.
Class IV: Undefined growth

For more information see presentation by T. Subba in NPF breakout

7. SHALLOW-TO-DEEP CONVECTION TRANSITIONS



15 Shallow-to-deep convection (> 5 km cloud-top height) cases observed at the main TRACER site

8. ACKNOWLEDGEMENTS

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9. REFERENCES

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[2] Jensen et al. (2022) doi:10.1175/BAMS-D-21-0104.1.
[3] Marinescu et al. (2021) doi:10.1175/JAS-D-20-0200.1
[4] Jensen et al. (2021) http://acpcinitiative.org/
[5] Melvin et al. (2023) AMS annual meeting