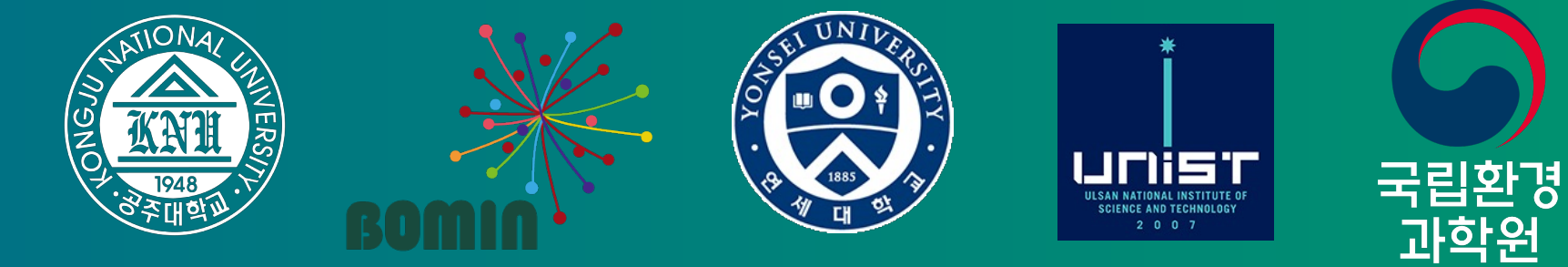


GEMS ozone product evaluation using ozonesonde measurements during the ACCLIP campaign

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Geostationary Environmental Monitoring Spectrometer (GEMS)

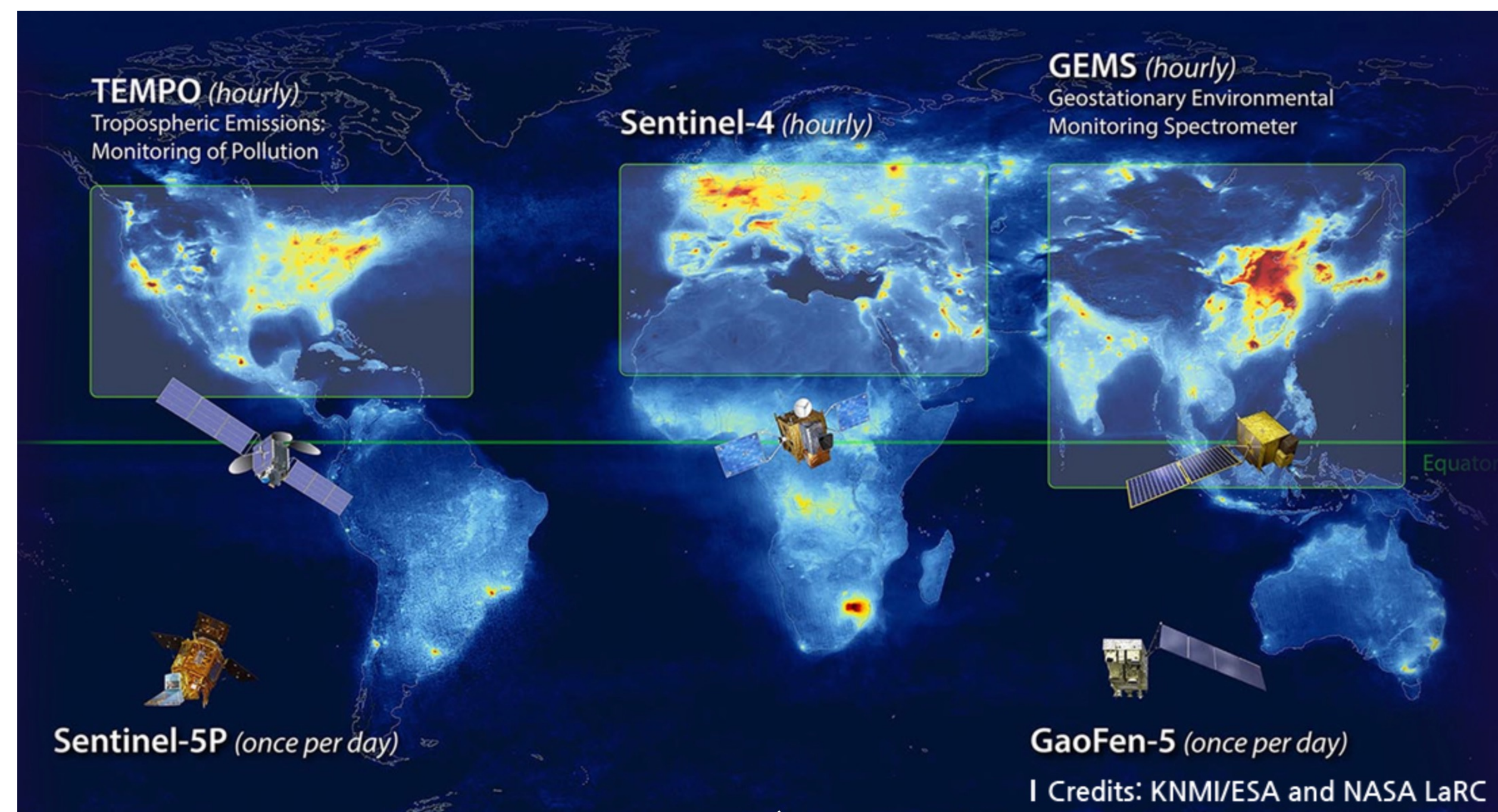


Fig.1 Spatial coverage of GEMS and companion GEO environmental satellites (Image from GEMS official site (<http://gems1.yonsei.ac.kr/>))

Asian Summer Monsoon Chemical and Climate Impact Project (ACCLIP)

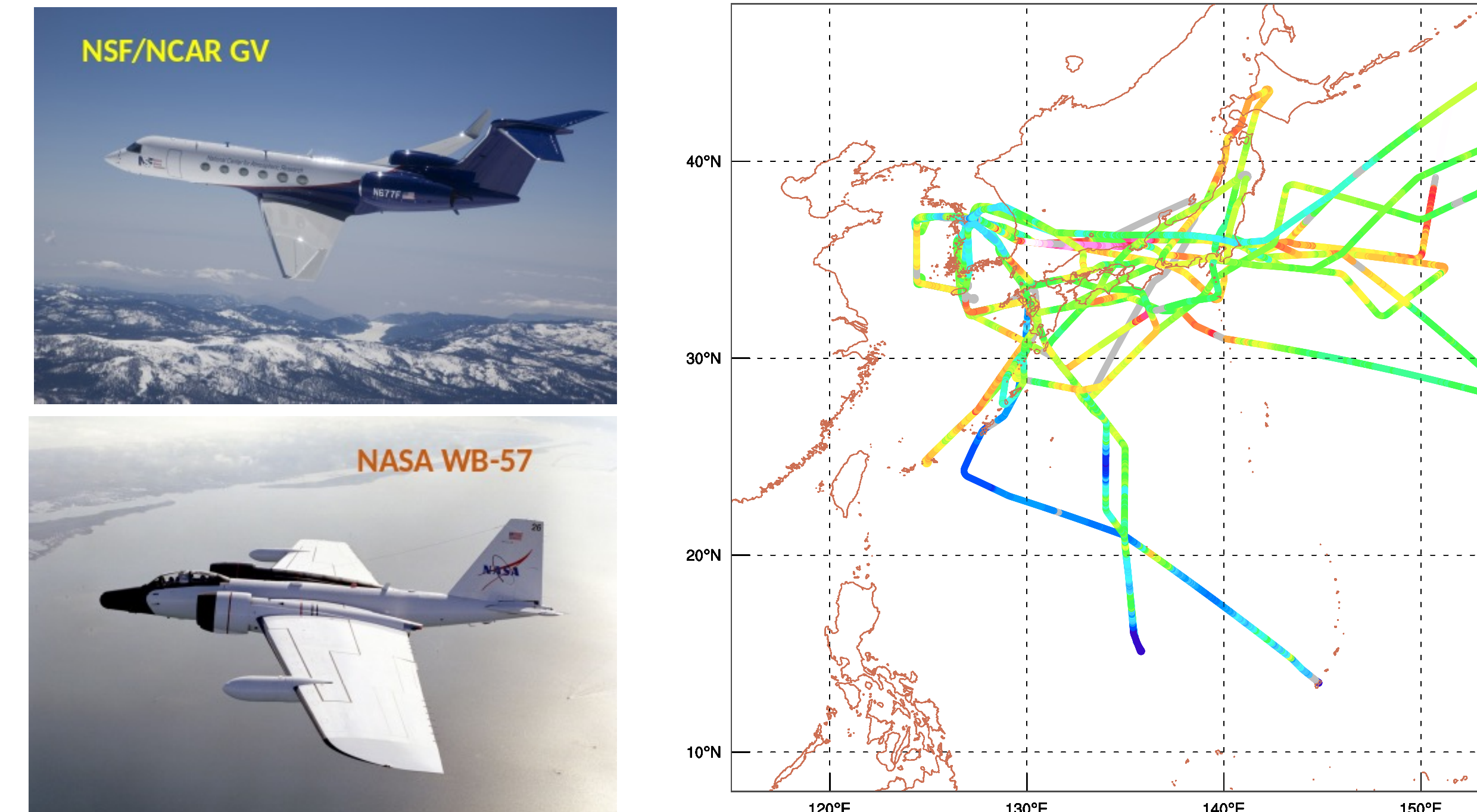


Fig.2 Two aircrafts used in ACCLIP and flight track of GV (upper one) during ACCLIP (Images from ACOM NCAR, <https://www2.acom.ucar.edu/acclip>)

To understand Asian gas and aerosol emissions and their impact on global chemistry through Asian Summer Monsoon (ASM) convective & circulation, airborne upper troposphere and lower stratosphere (UTLS) chemistry measurements were made over Korea and Northwestern Pacific in August 2022. Comprehensive data on trace gases, aerosols, clouds, and radiation were obtained through 31 research flights (GV: 14 RFs + WB: 17 RFs)

Ground measurements

Balloon-based ground measurements of O₃, aerosols, and LS water vapor were also conducted over S. Korea, Taiwan, Palau. This study uses daily 38 ozonesonde measurement data from S. Korea (Anmyeon site, 36.54°N 126.33°E).

GEMS Ozone profile product (O3P)

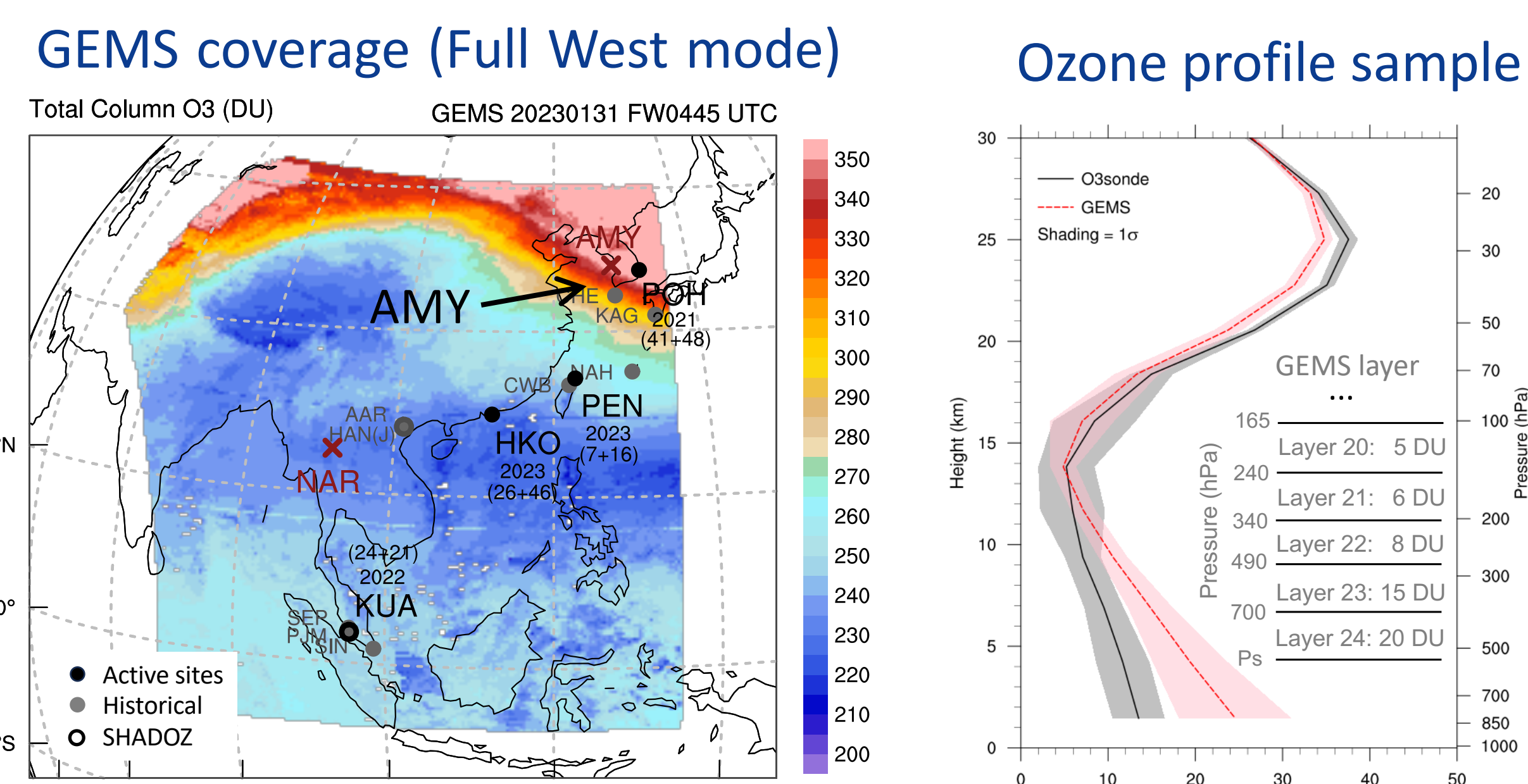


Fig.3 [Left] Total column ozone from GEMS with historical Ozonesonde sites (only black markers are active). [Right] GEMS ozone profiles in 24 layers

GEMS Averaging kernel (GEMS O3P only use Huggins bands)

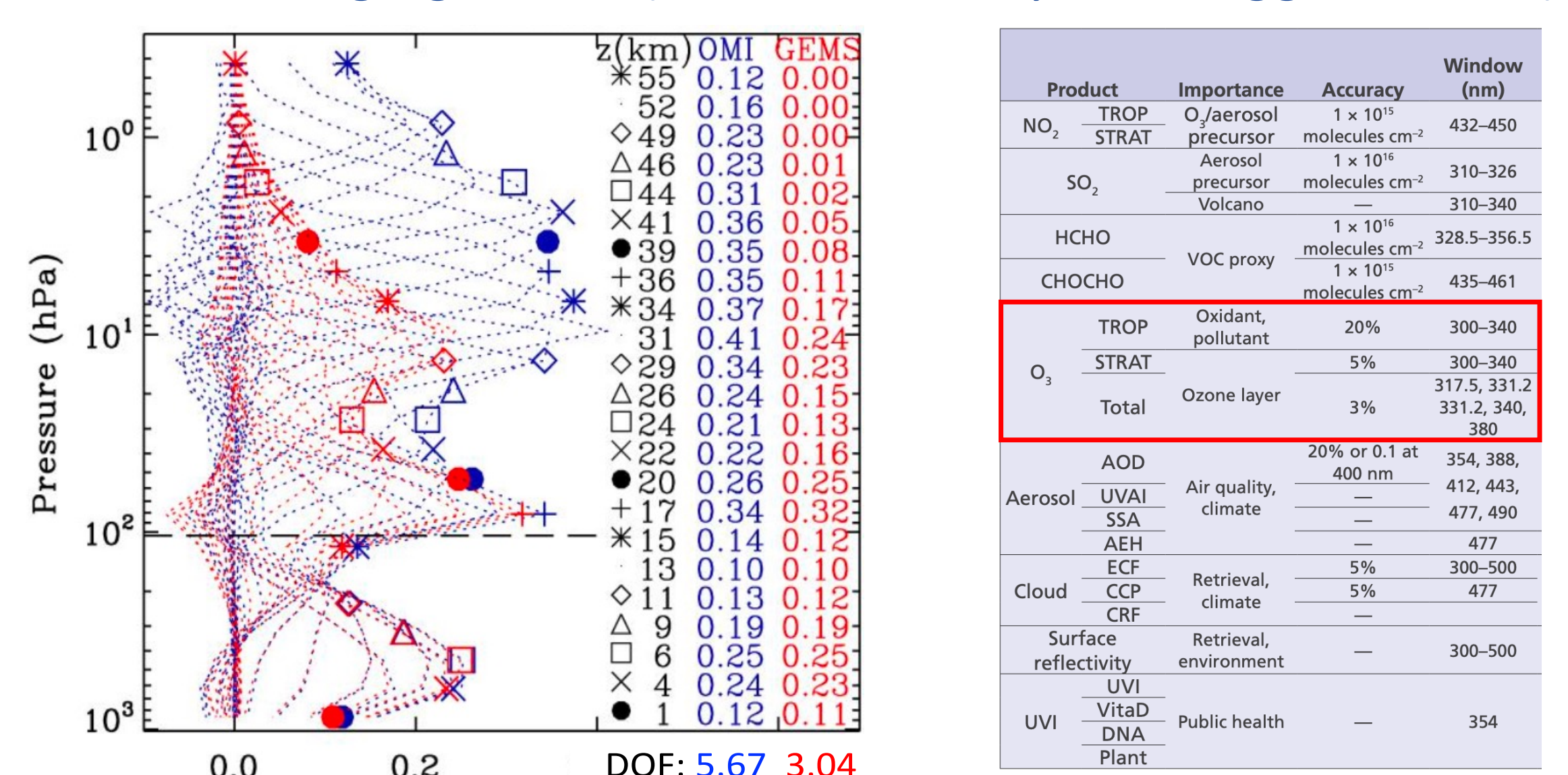
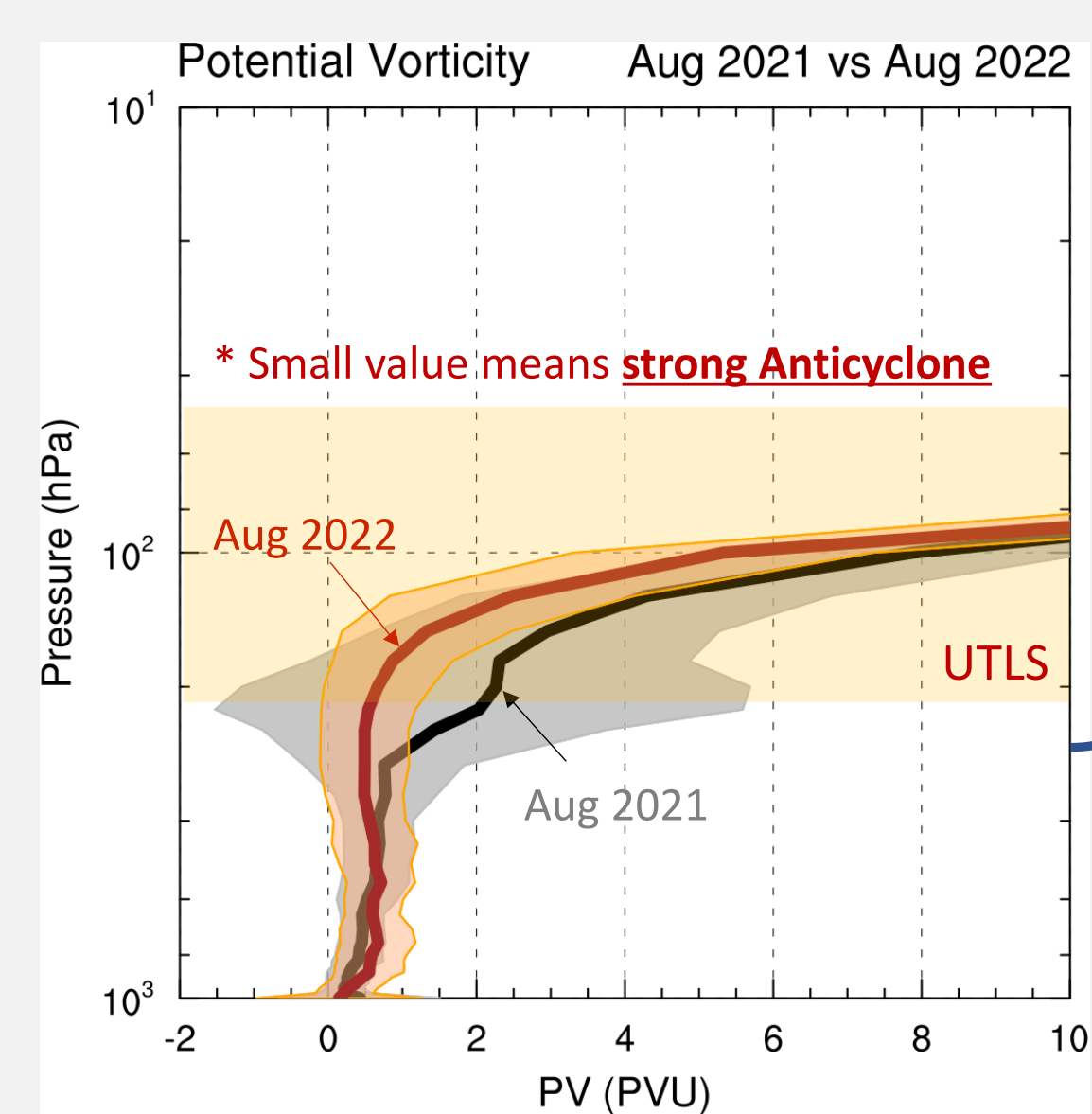


Fig.4 GEMS averaging kernel (2020 NIER), channel information (Kim et al. 2020)

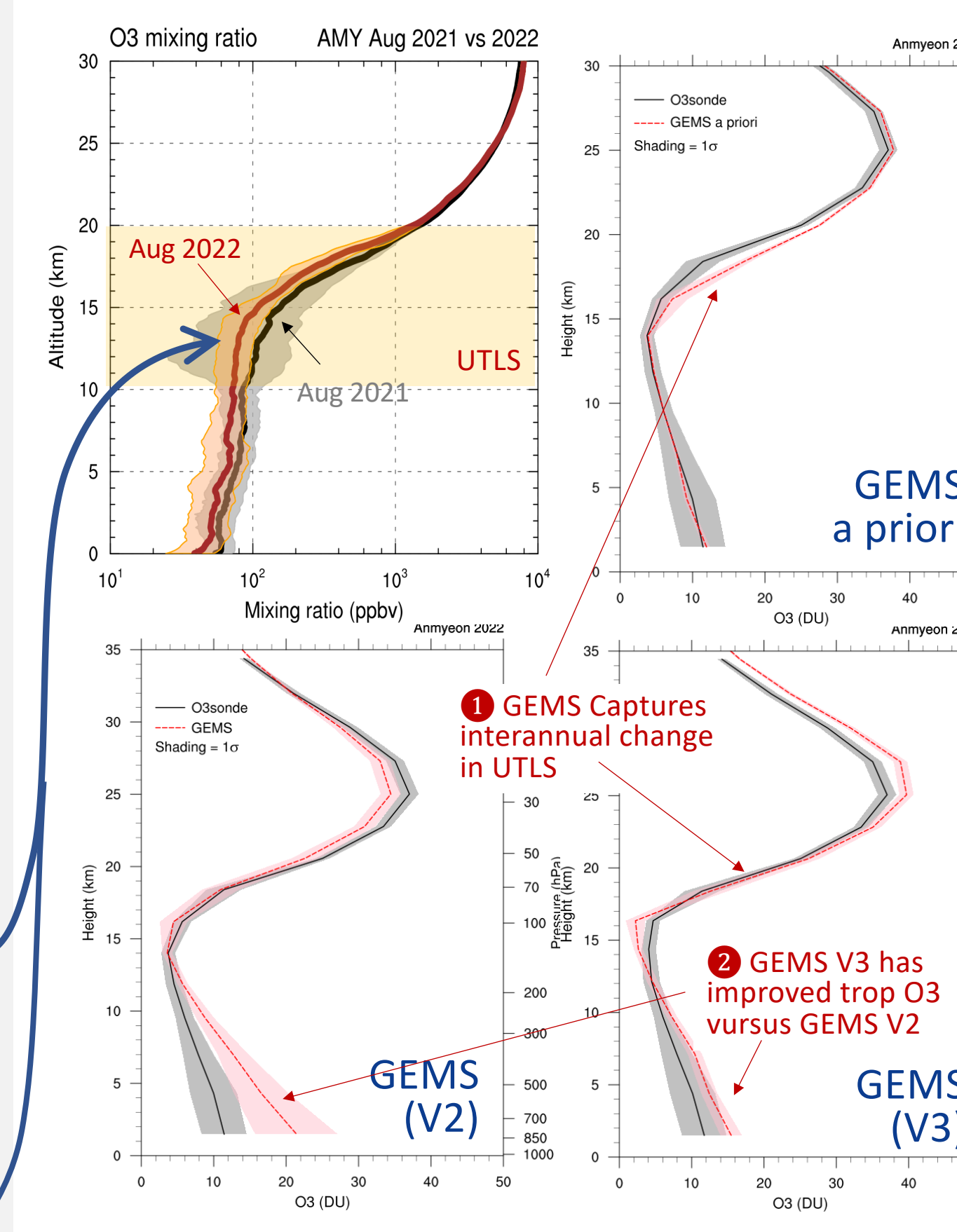
Comparison

ASM activity and anticyclone were "significantly stronger" than normal, it covers the whole Korean Peninsula leading to low ozone (and low potential vorticity) in the UTLS

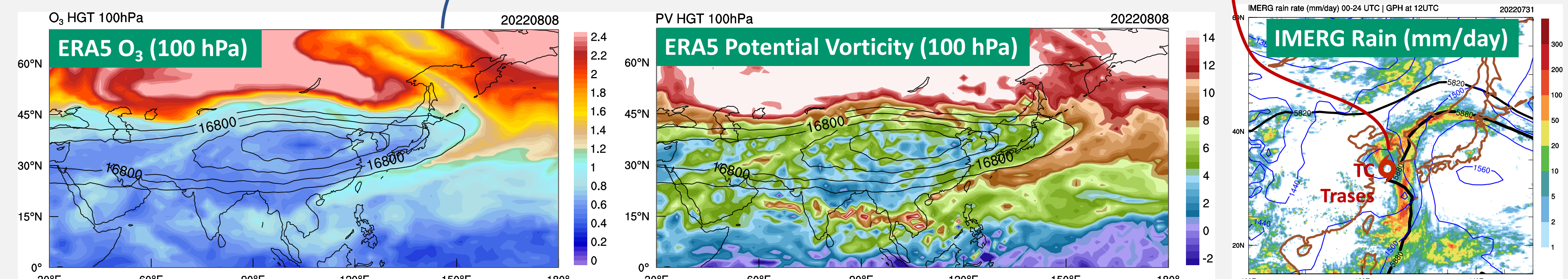
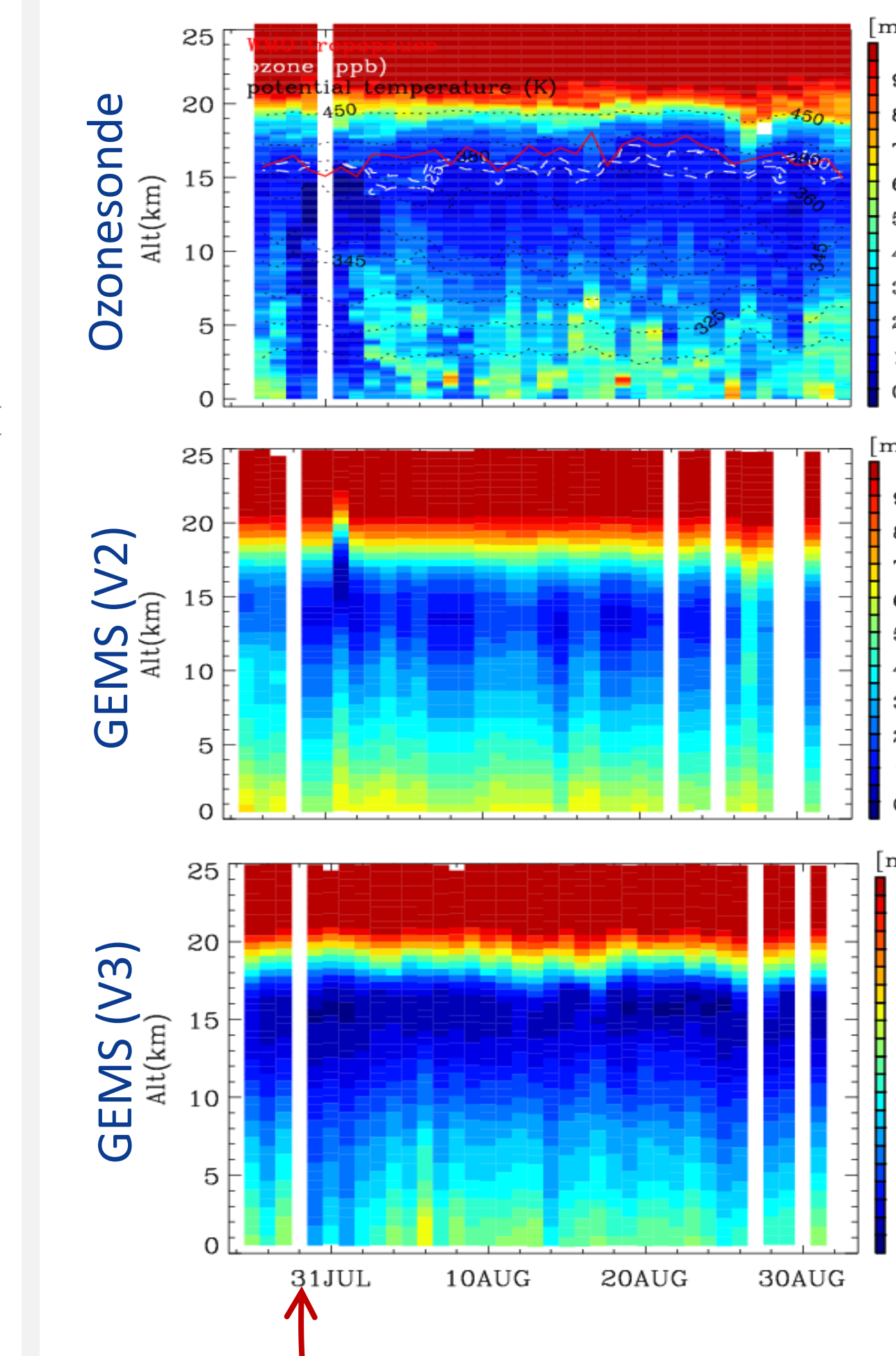


Averaged O3 profile

UTLS ozone: GEMS is better than Clim Trop ozone: GEMS V3 is better than V2

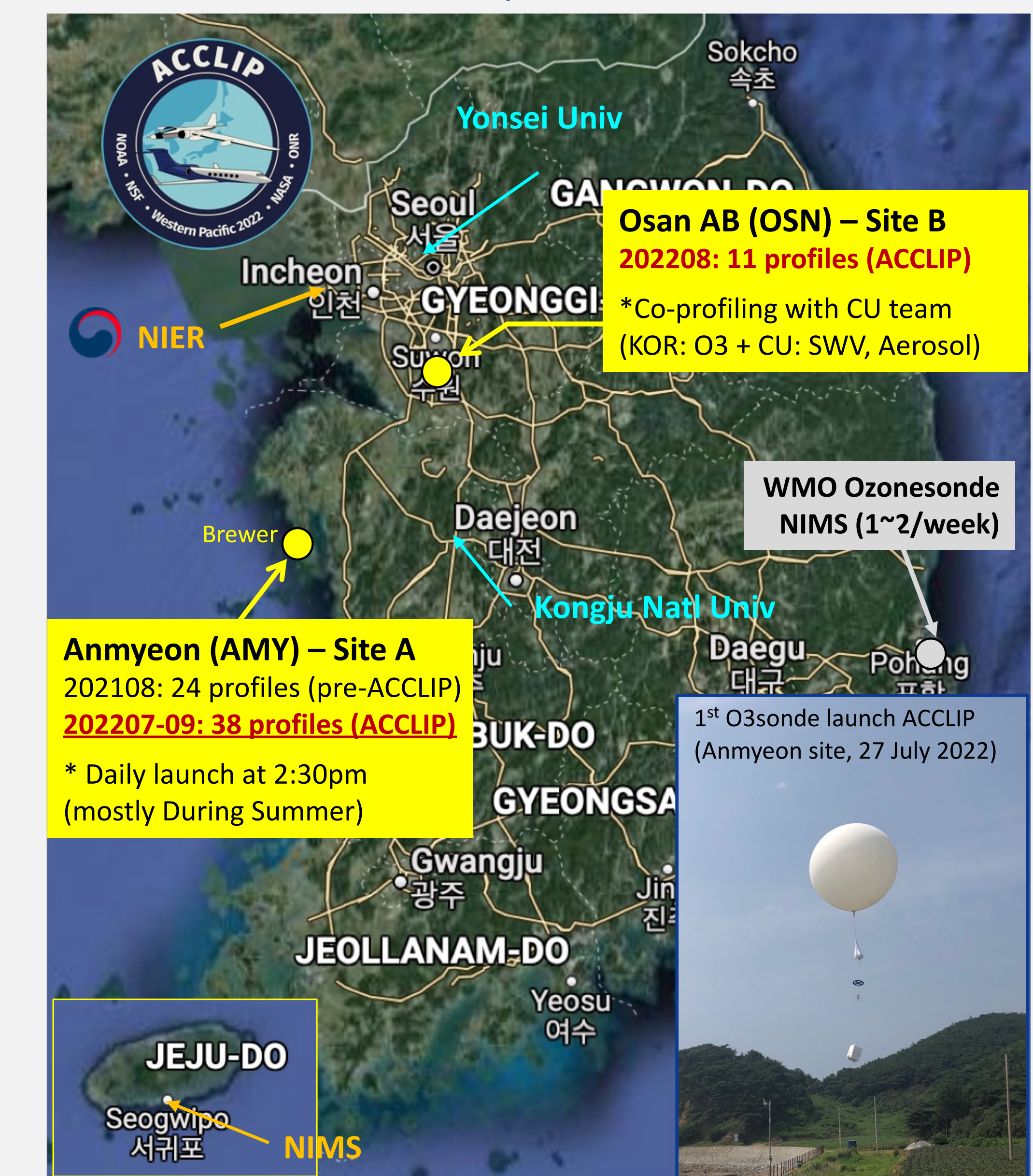


O3 variability during ACCLIP



Ozonesonde measurements

Number of ozonesonde profiles at each site in S. Korea



Acknowledgments

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Summary

1. New version of GEMS O₃ product (O3P Ver.3) shows improved ozone variability in the troposphere.
2. GEMS O3P (Ver.3) shows good potential of capturing daily O₃ variability (STE, convective influence) in the troposphere.
3. Year-to-year changes of O₃ in the troposphere and lower stratosphere are reasonably captured, but need further evaluations.
4. ACCLIP Ozonesonde measurements significantly contributed to the improvement of the GEMS O₃ product (O3P Ver.3).

Further study

1. Evaluation of the seasonal evolution of the Trop. and Strato. ozone
2. Continued measurement of ozonesonde for interannual evaluation
3. Adding more O₃ profile measurements over Asia
4. Cross-validation with chemical reanalyses and modeling products