

Asia Network of surface ozone monitoring – Japan, East Asia, and beyond...

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NIES's ozone standard activity since 2002

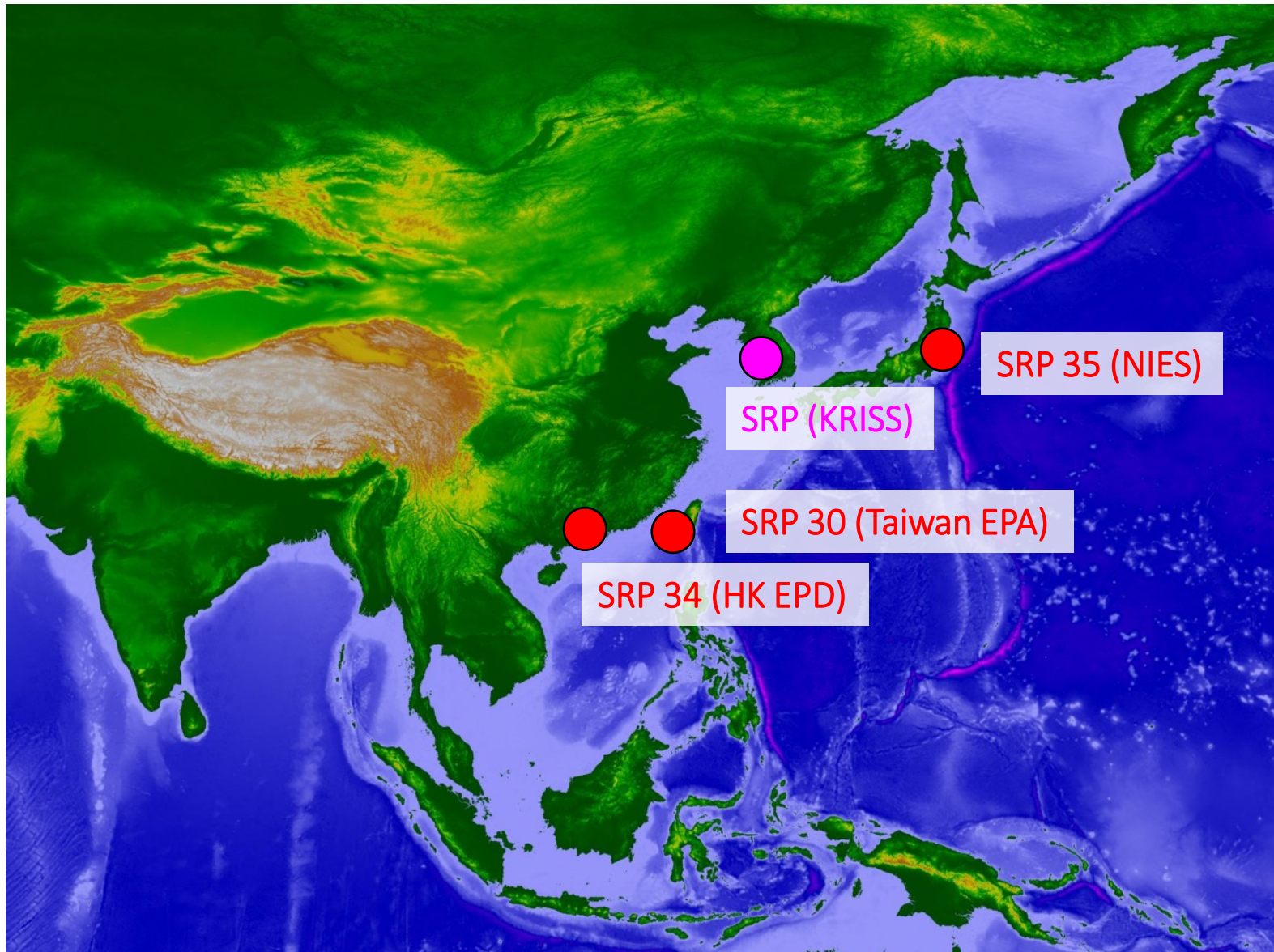
- The major objectives were to:
 - i. pursue reliable reference standards (i.e. SRP vs. GPT),
 - ii. achieve international comparability (with BIPM and NIST),
 - iii. establish regional traceability network for field studies,
 - iv. make/maintain a traceability system in Japan (with MOE-J),
 - v. act as a reference center for some monitoring networks,
 - vi. discuss an opportunities/challenges to be a national reference/calibration center in Japan (with NMIJ)

for ozone, one of the most “environmentally” important trace gases in the troposphere from local to global perspective.

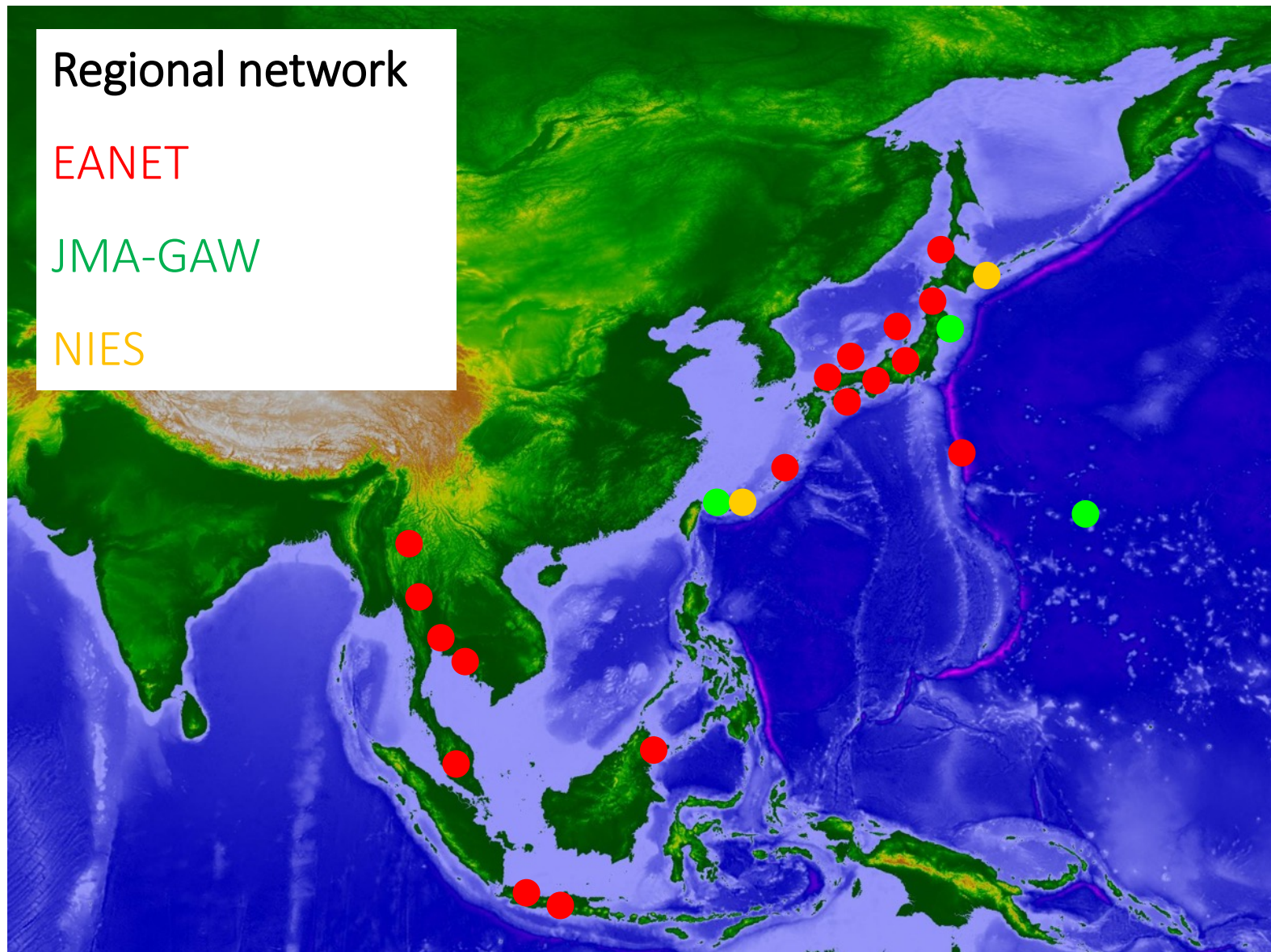
Since its beginning...

2002 -- 2003	<ul style="list-style-type: none">• NIES GPT vs. NIST SRP #2 “informal” intercomparison
2004 April	<ul style="list-style-type: none">• NIST SRP #35 delivery and deployment at NIES• Improvement in NIES GPT system
July	<ul style="list-style-type: none">• International comparison for national ozone standards at BIPM (CCQM-P28)
2005 January	<ul style="list-style-type: none">• NIES GPT vs. NIST SRP #35 comparison
March	<ul style="list-style-type: none">• International intercomparison during ABC Gosan campaign at Jeju Island, Korea
2006	<ul style="list-style-type: none">• Building traceability network in Japan for air quality monitoring by Ministry of Environment, Japan• NIST SRP #47 delivery and deployment at NIES

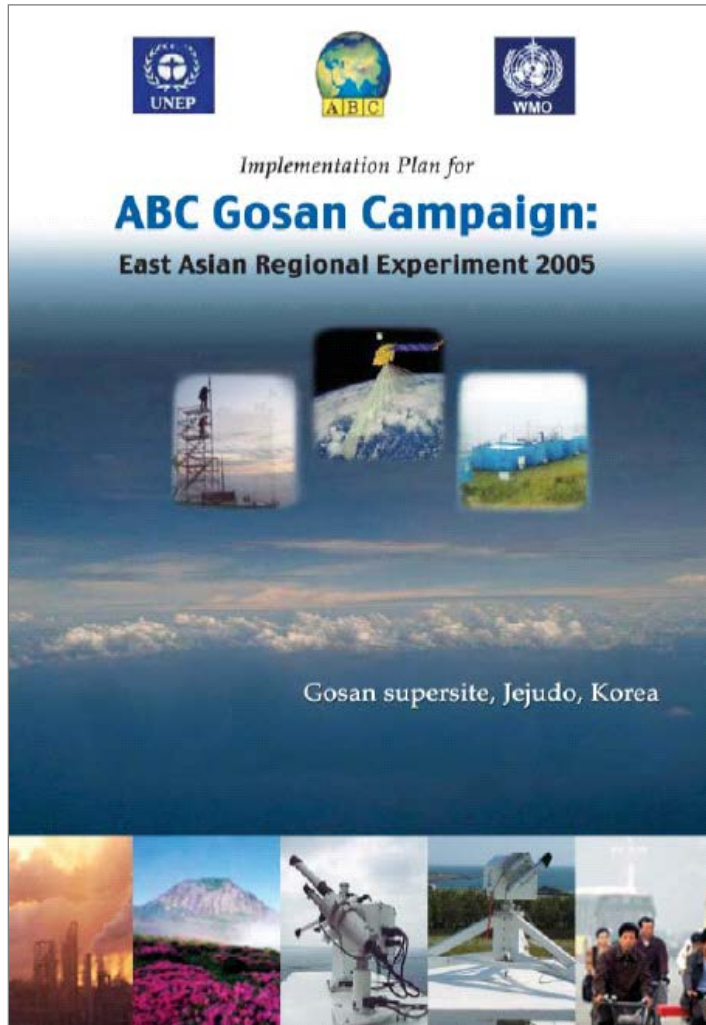
In 2004, four SRPs in Asia



Surface O₃ monitoring networks in East Asia

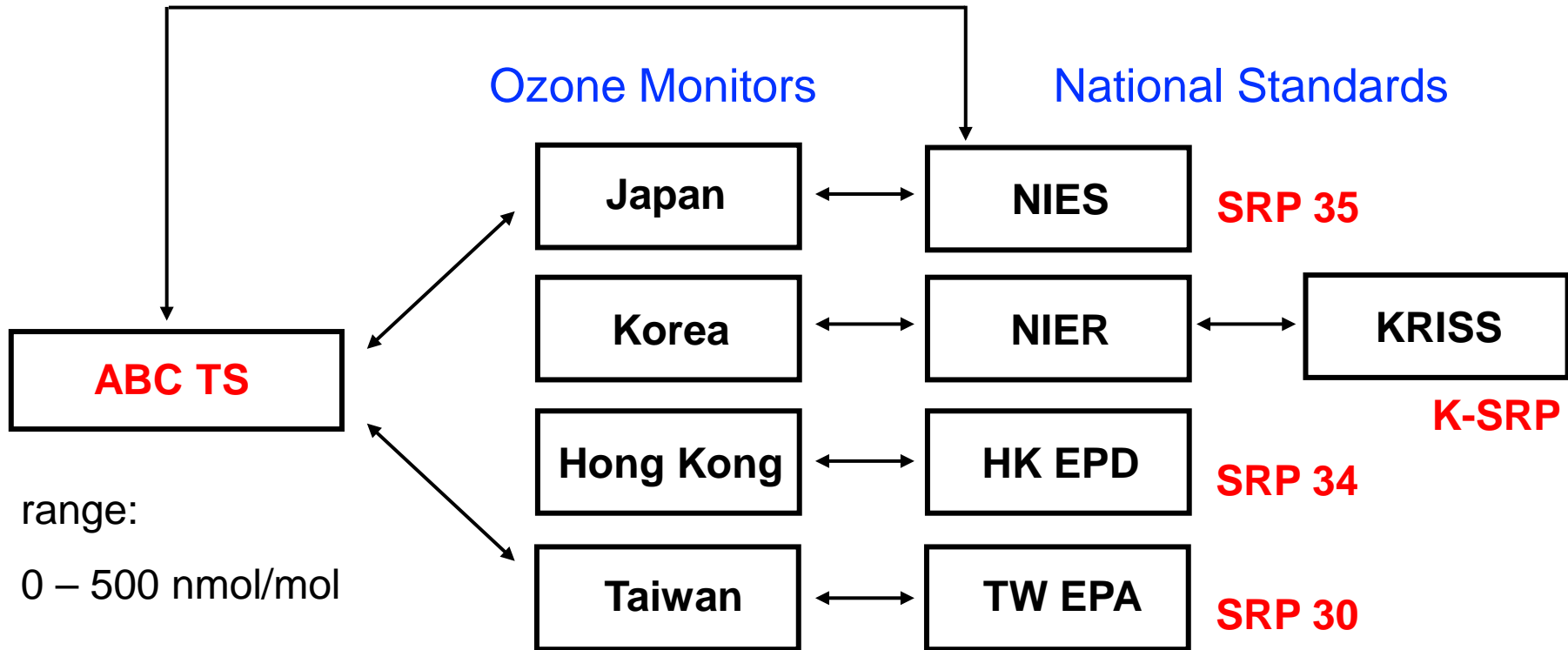


ABC-East Asia campaign



- Regional traceability network is to be established to detect possible changes in current and future air quality in East Asia
- O₃ instruments - UV photometry - are well-designed
 - same method, but different manufacturer/model (e.g., Dasibi, TEI, Horiba, 2B Tech, ...)
- Major effort is:
 - to establish **calibration/correction criteria within ABC**
 - to make **linkage with other groups/networks (GAW, etc)**

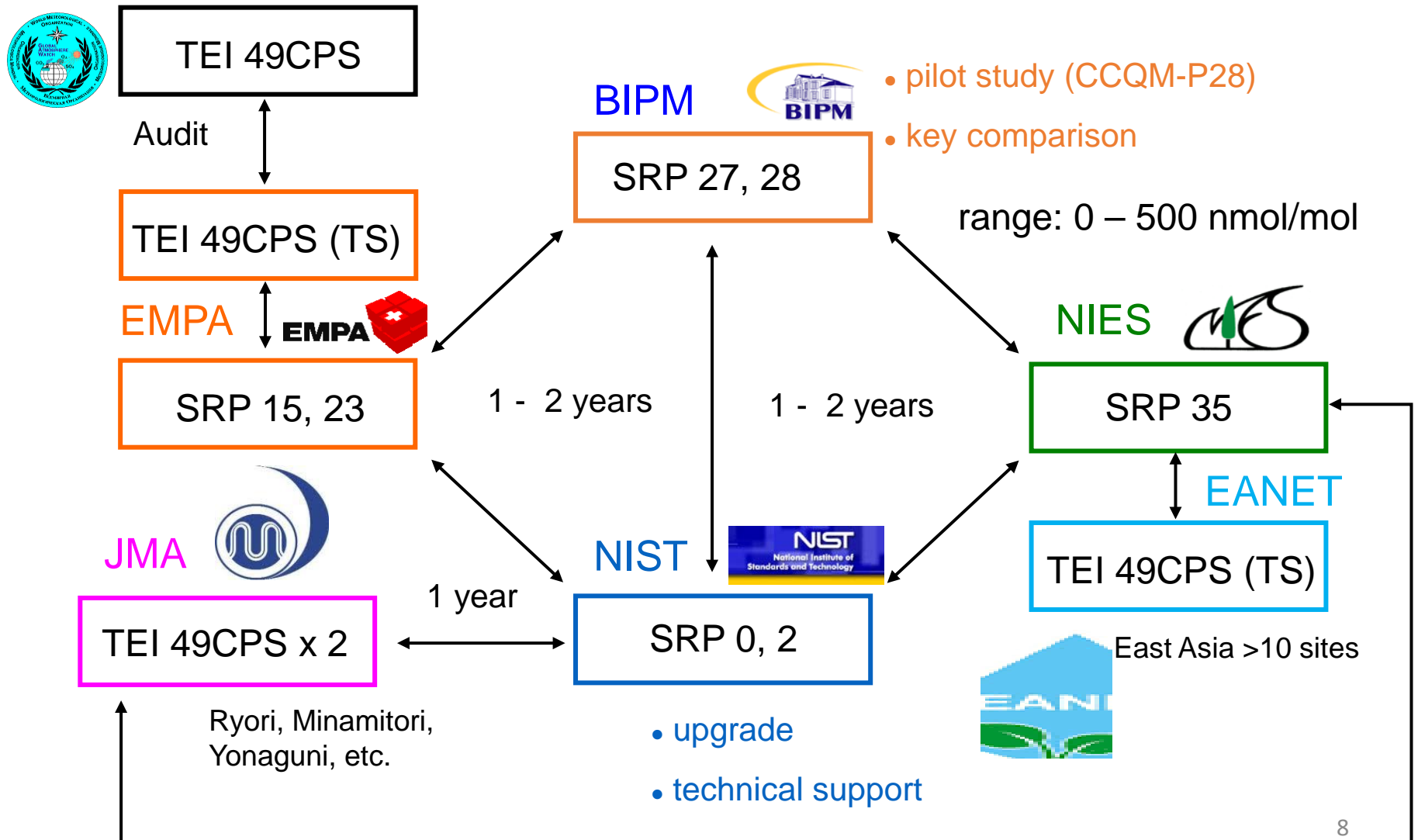
Intercomparison outline



- Regional traceability network is to be established to detect possible changes in current and future air quality in East Asia
- Major effort is:
 - to establish [calibration/correction criteria within ABC](#)
 - to make [linkage with other groups/networks \(GAW, etc\)](#)

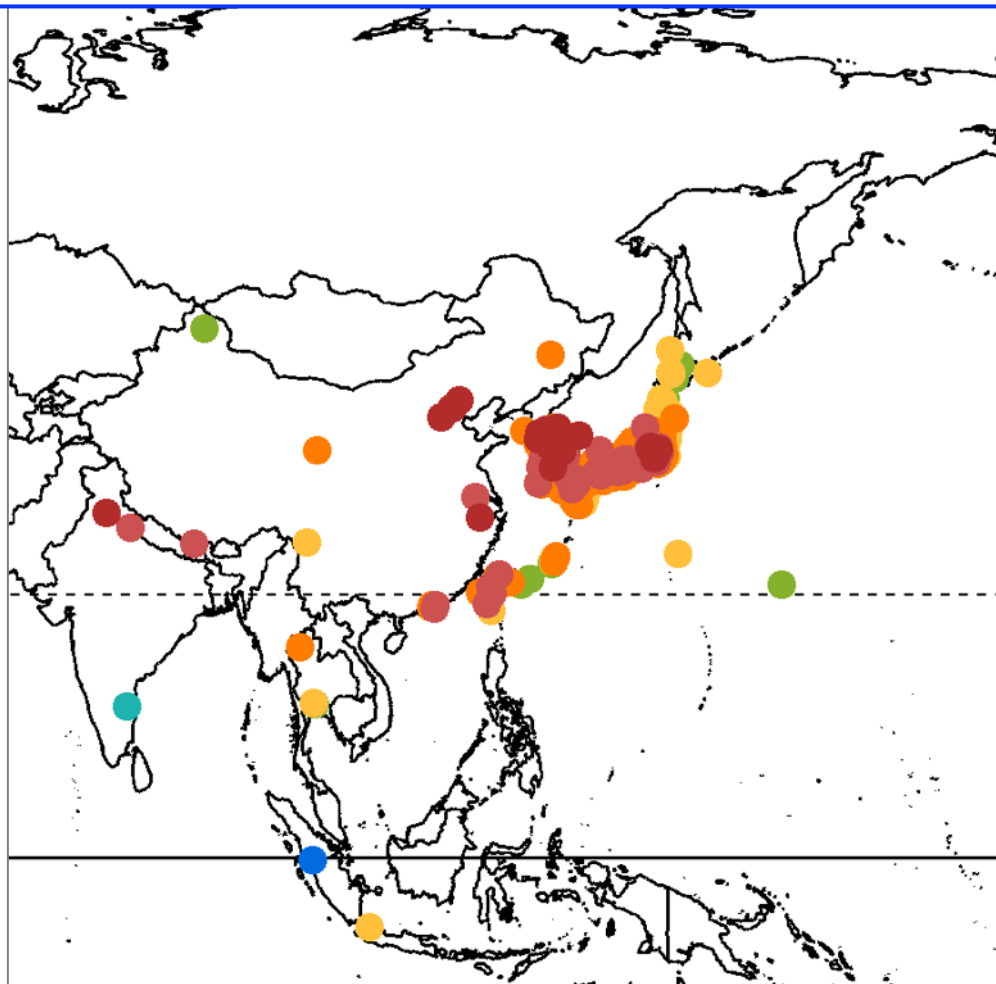
SRP-based linkage with other programs

GAW sites



Surface O₃ monitoring networks in East Asia

98th percentile ozone value, summer Data extracted on: 2016-10-24
perc98 ozone, 2010-2014 (minimum 3 years): 4792 all sites

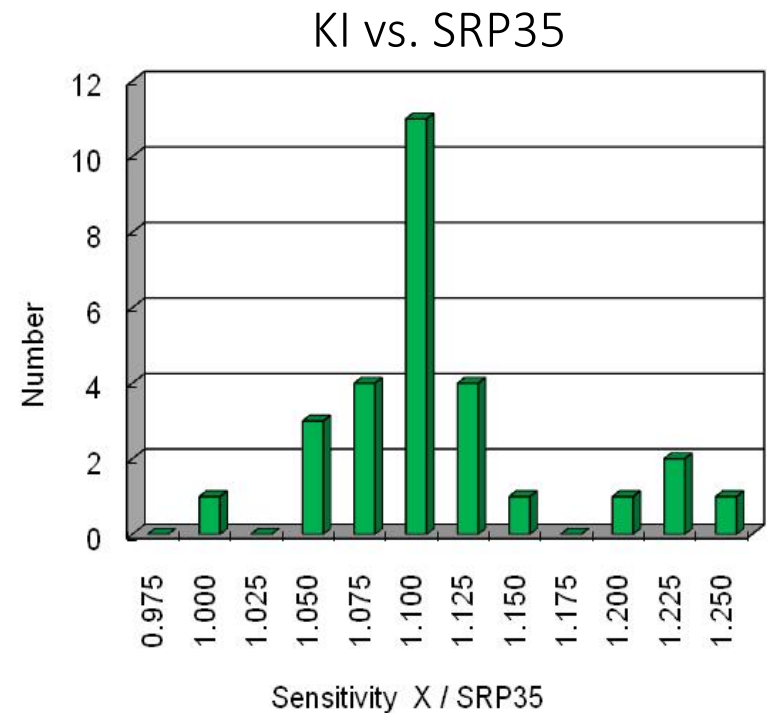
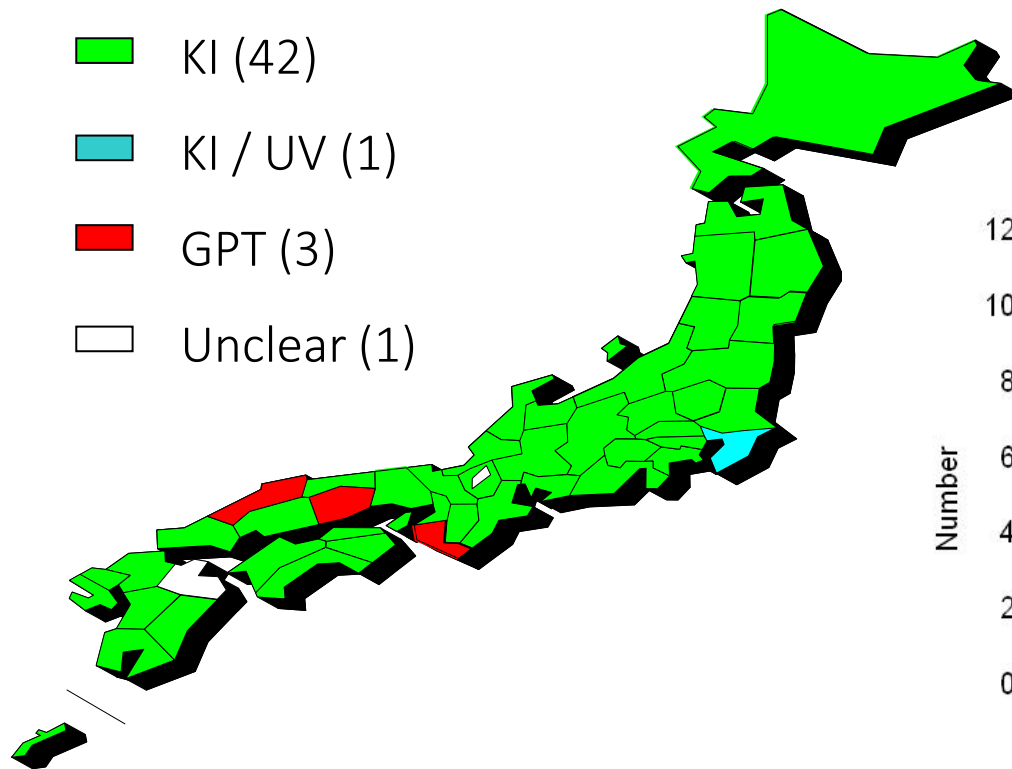


TOAR
tropospheric
ozone
assessment
report
Phase II

Japan's operational monitoring network,
Ministry of Environment, Japan

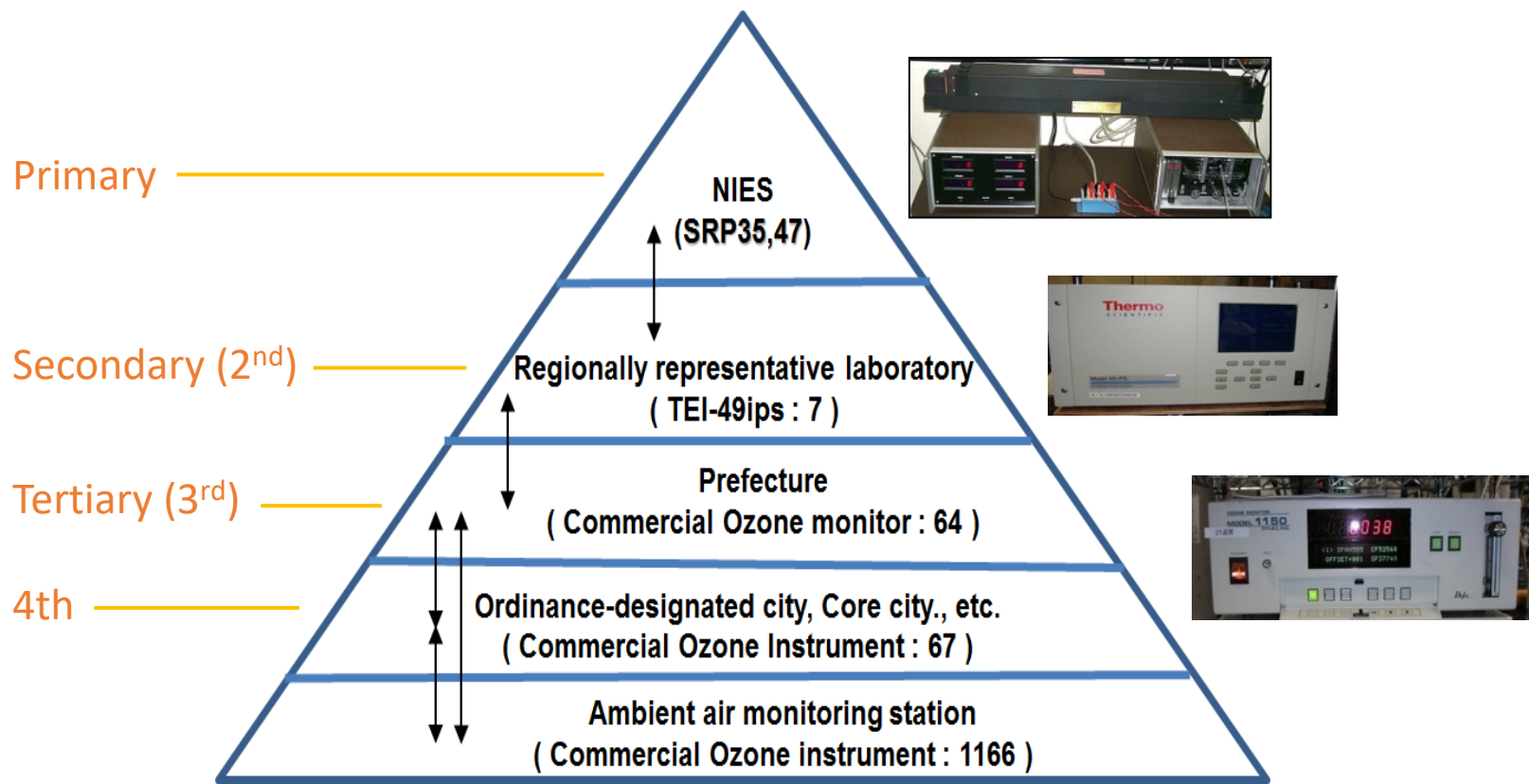


Japan's traceability system/network, 1970-2000s



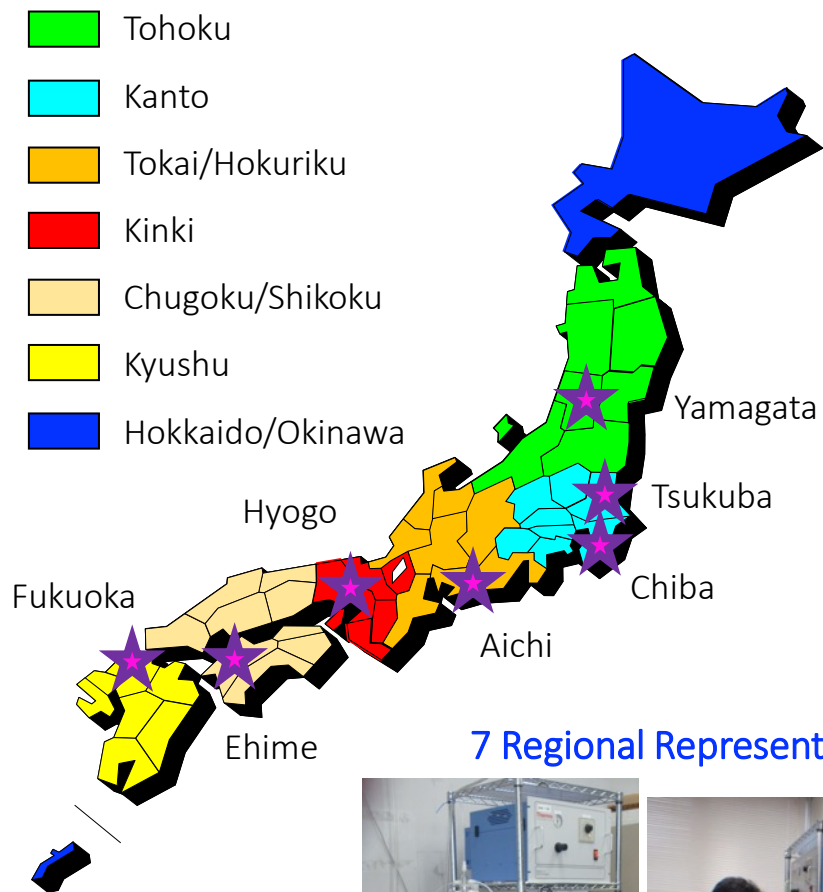
- 42/47 local governments used the KI method for calibration of ozone monitors
- The KI method had a wide range of sensitivity and higher average (10%) than that of the UV method

Japan's traceability system/network, 2010s

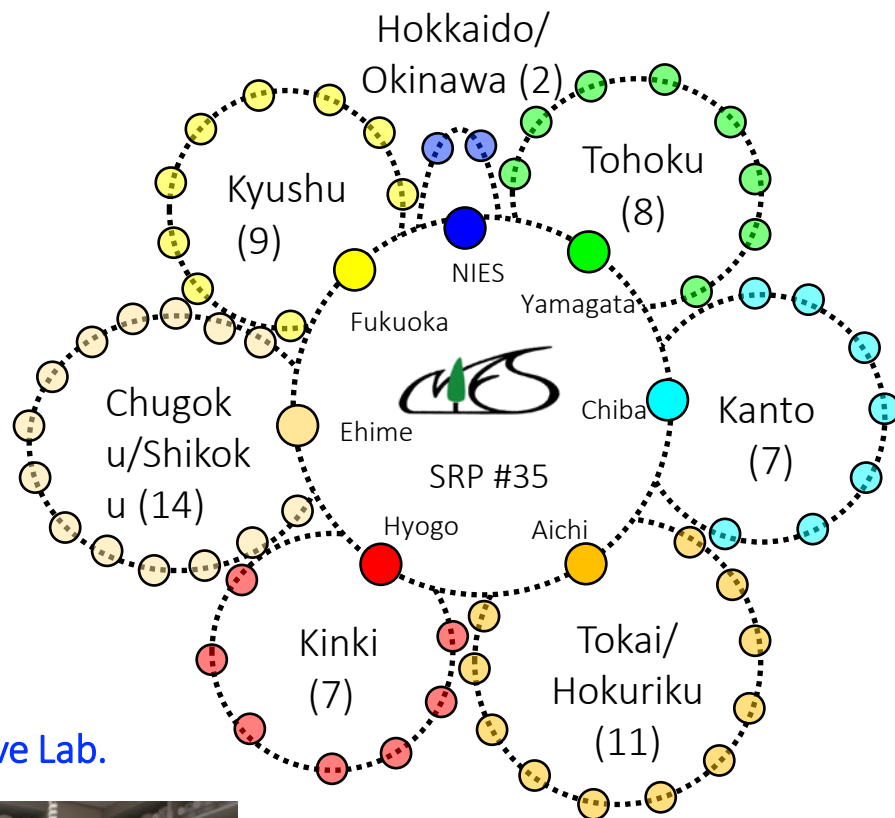


- Five-layer-“top down” traceability system based on SRP 35/47
- SRP-vs.-secondary standard comparisons are made annually
- Secondary-vs.-tertiary standard comparisons are made twice a year (before/after photochemical smog season)

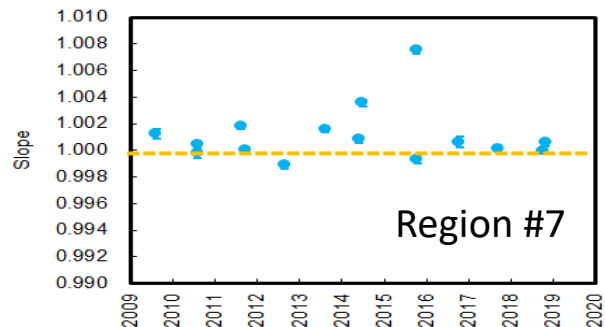
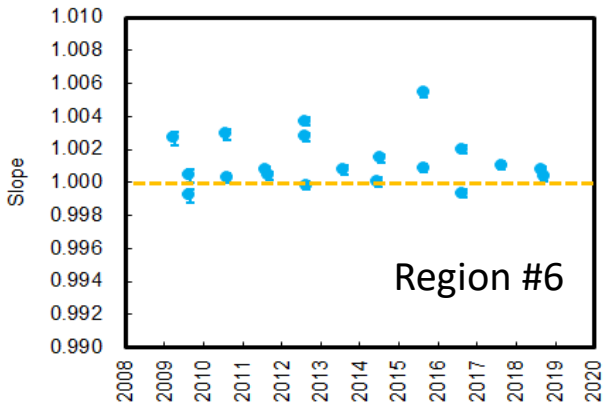
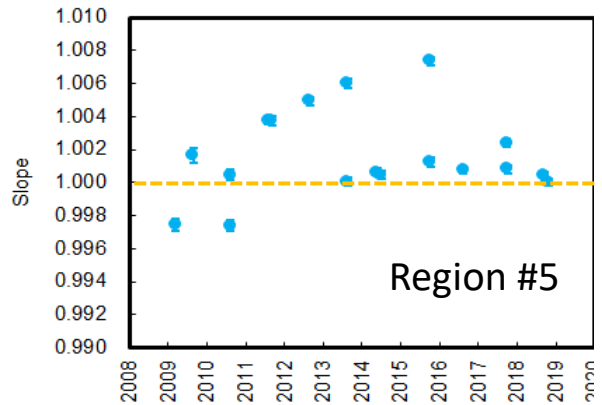
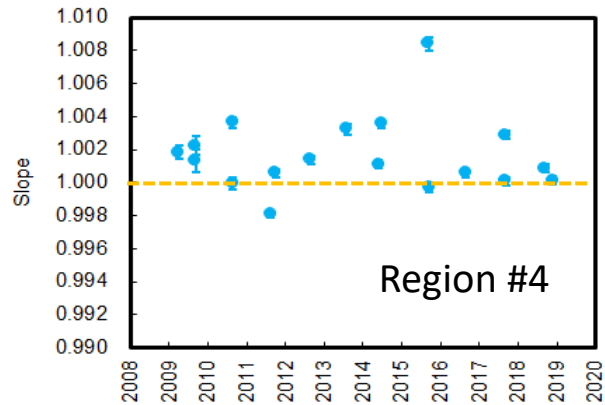
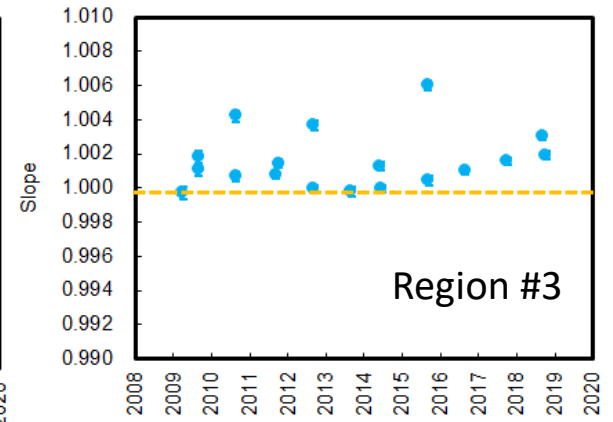
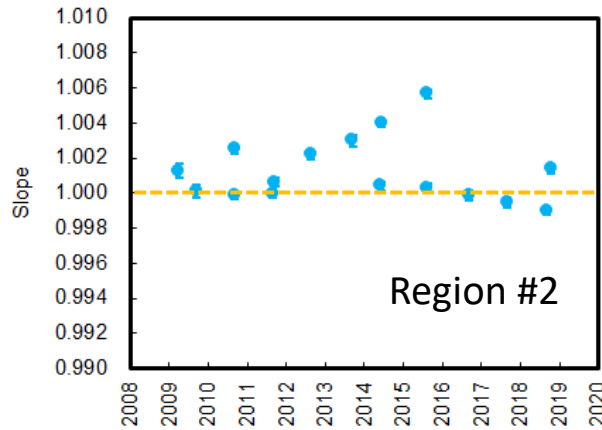
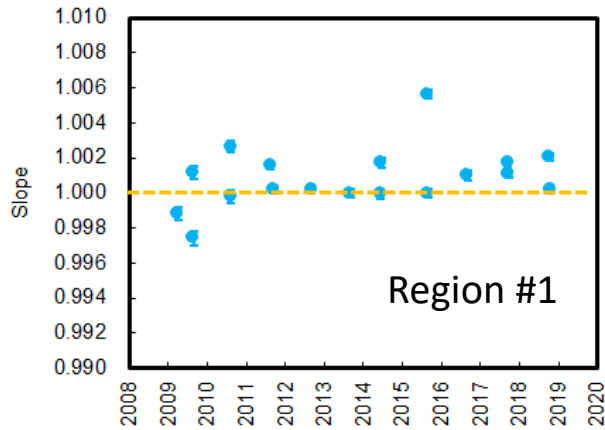
Japan's traceability system/network, 2010s



7 Regional Representative Lab.

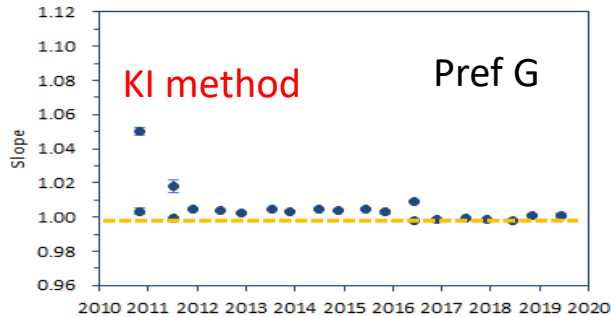
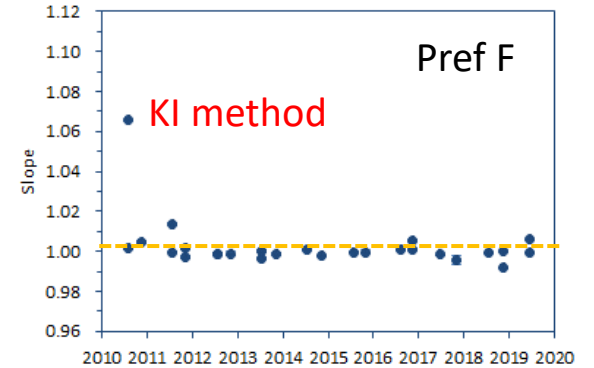
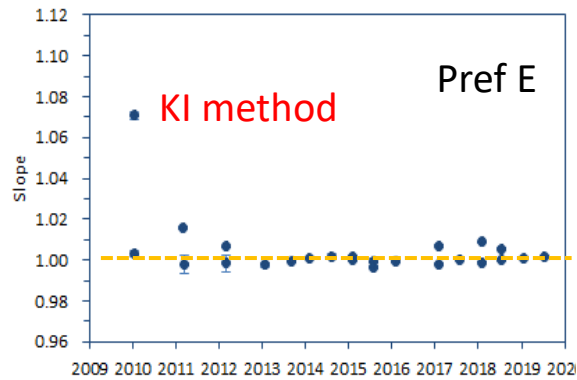
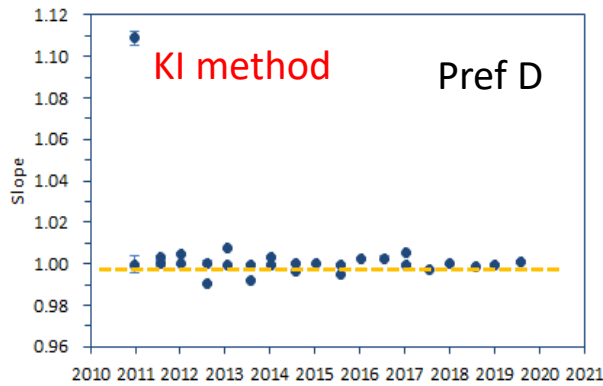
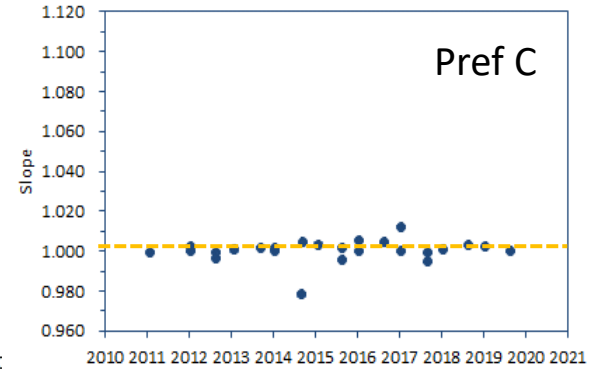
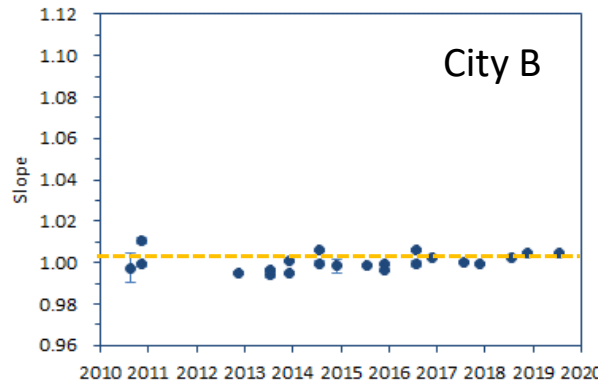
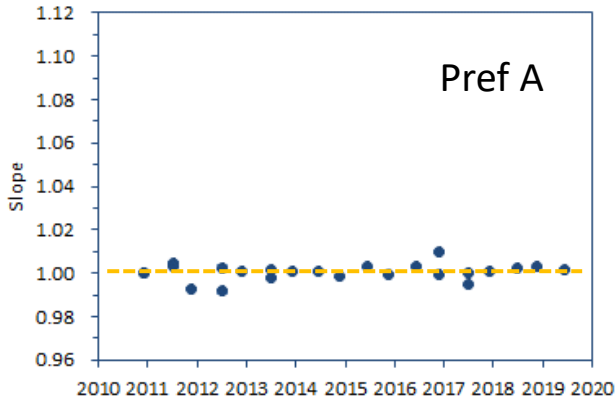


Stability of 7 secondary standards, 2010-2019

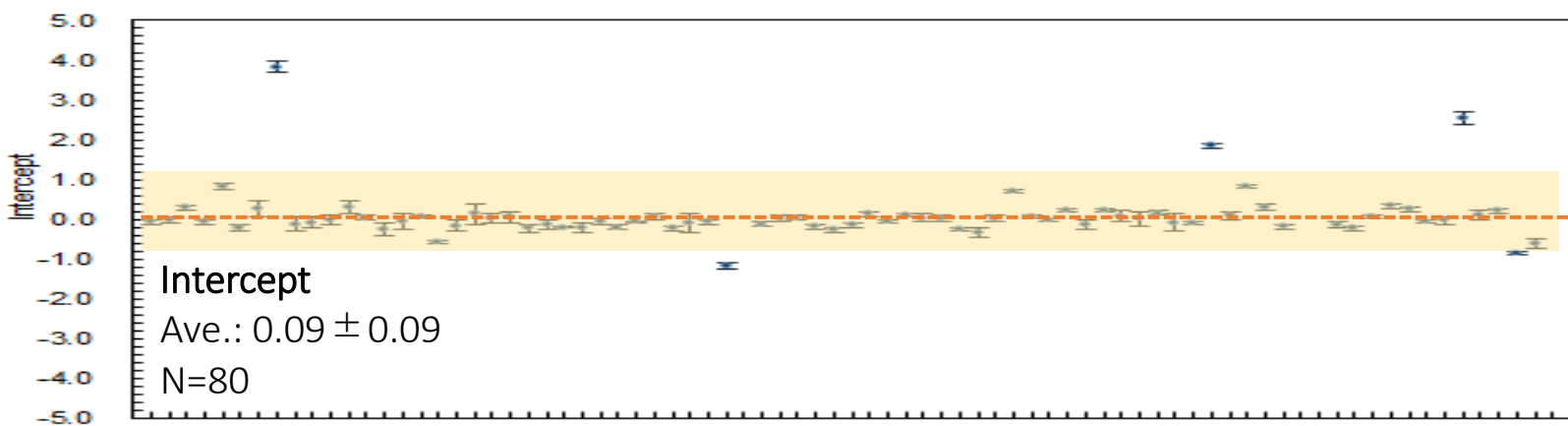
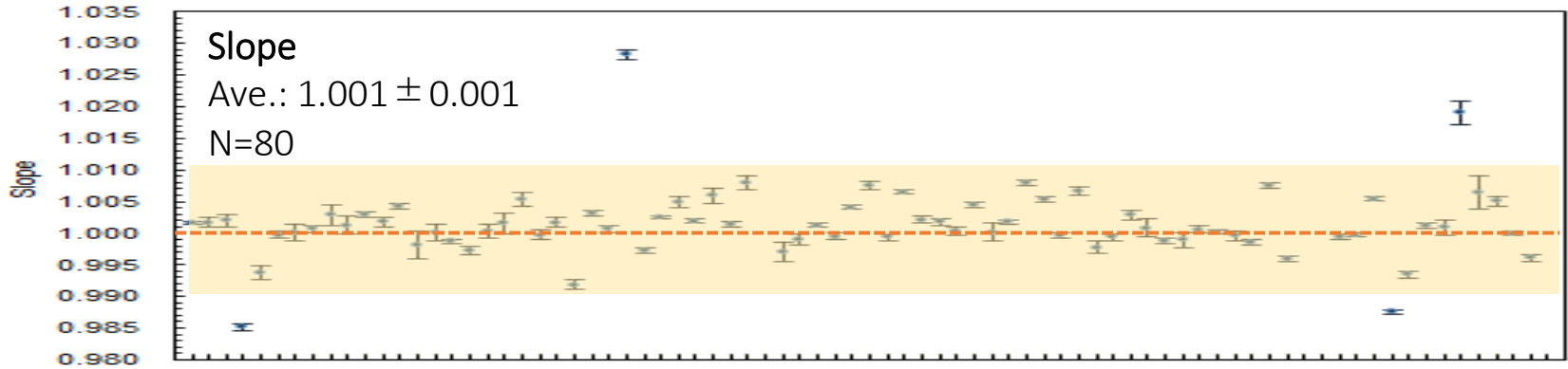


- Over the past 10 years, secondary standards have been stable at 1.002 ± 0.002 in reference to SRP 35

Stability of tertiary standards, 2010-2019

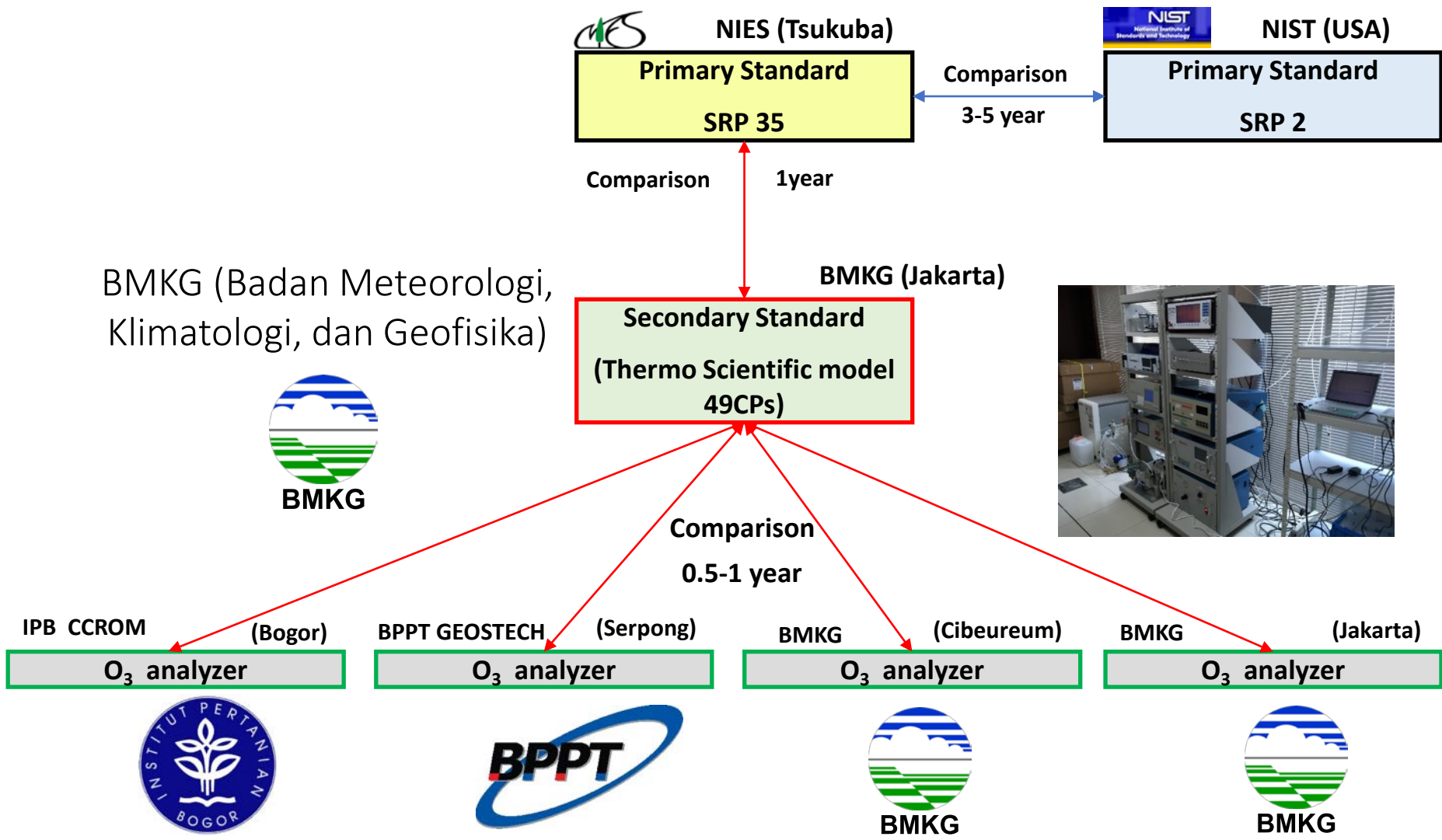


Comparisons of tertiary vs. secondary standards



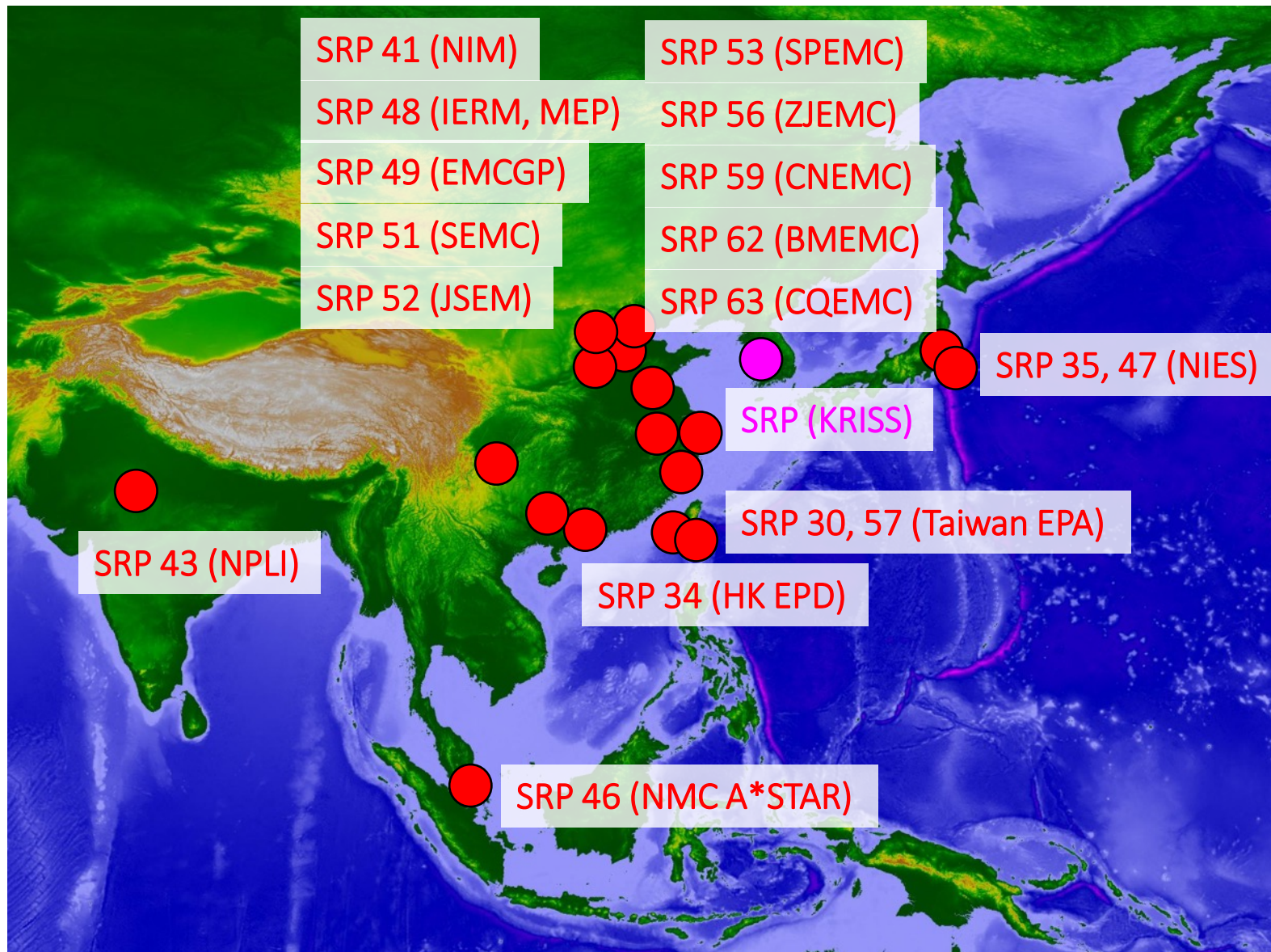
- Majority of tertiary standards are within 1% (slope) and 1 ppb (intercept) in reference to secondary standards
- Some are outside of these ranges

NIES SRP works as a reference for Indonesian sites



Credit: Hitoshi Mukai, Shigeru Hashimoto

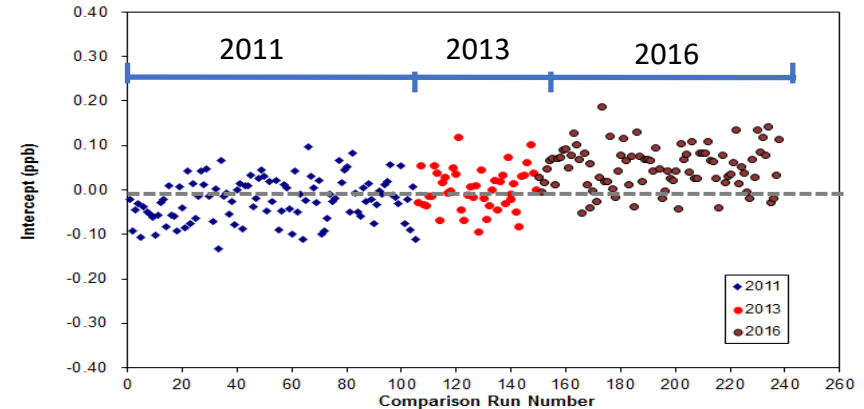
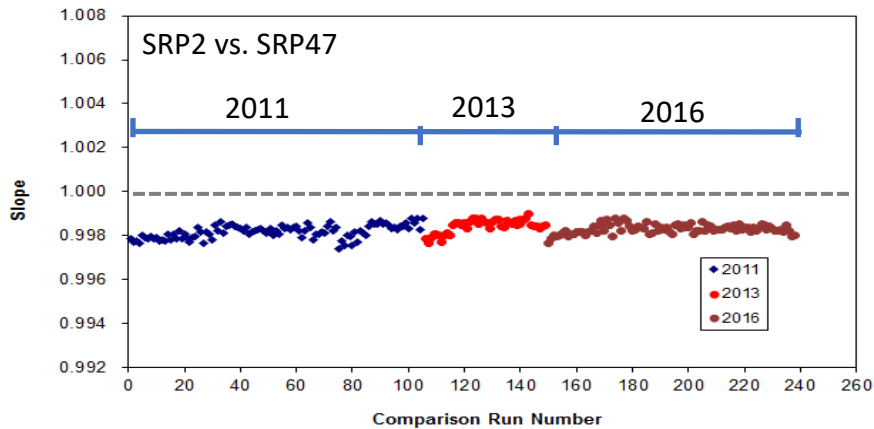
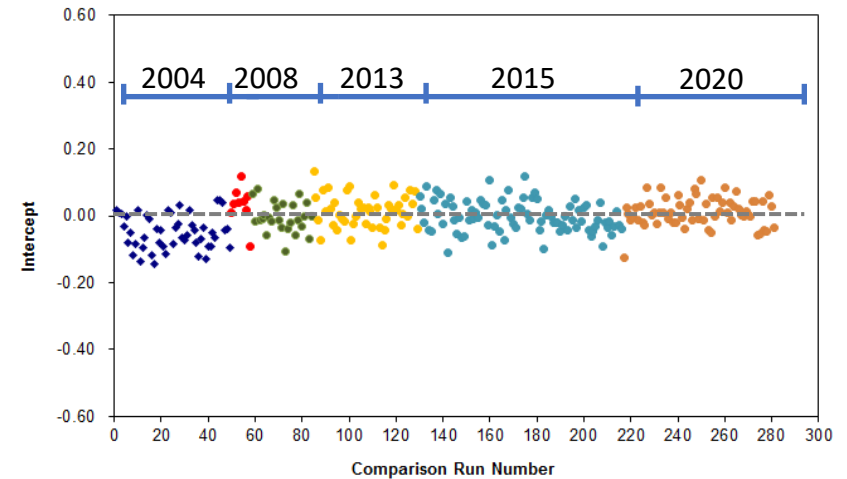
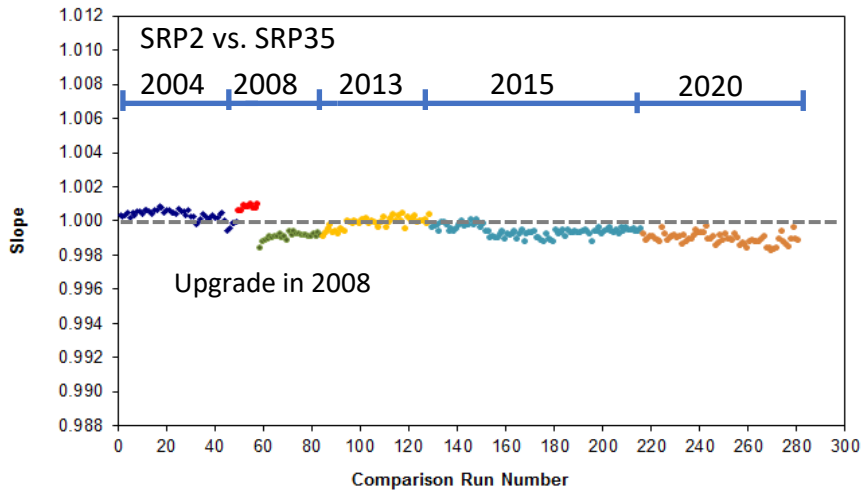
In 2020, eighteen(!!) SRPs in Asia



Summary

- In Asia, the capacity of ozone standards as well as ambient monitoring has shown a great progress over the past decade, in both quality and quantity
- In East Asia, there were “research-level” efforts of coordination to make sure of regional traceability, and this helped assure a comparability of ozone monitoring data, including WMO-GAW and EANET
- These efforts were mainly for East Asia, not for the rest of Asia
- As a joint NIES-MOE-Japan efforts, Japan established a traceability system for operational monitoring network and it is working quite well
- The current style is rather a “grass-roots” type, so whether we should move to more “top-down” style of intercomparison, traceability system, or regional coordination exercise (in addition to CCQM) is the next question to be discussed among stakeholders from metrology, environment, and meteorology communities
- It seems that there are no substantial efforts on ozone standards in APMP (Asia Pacific Metrology Programme), though there are some on standards of other gaseous air pollutants

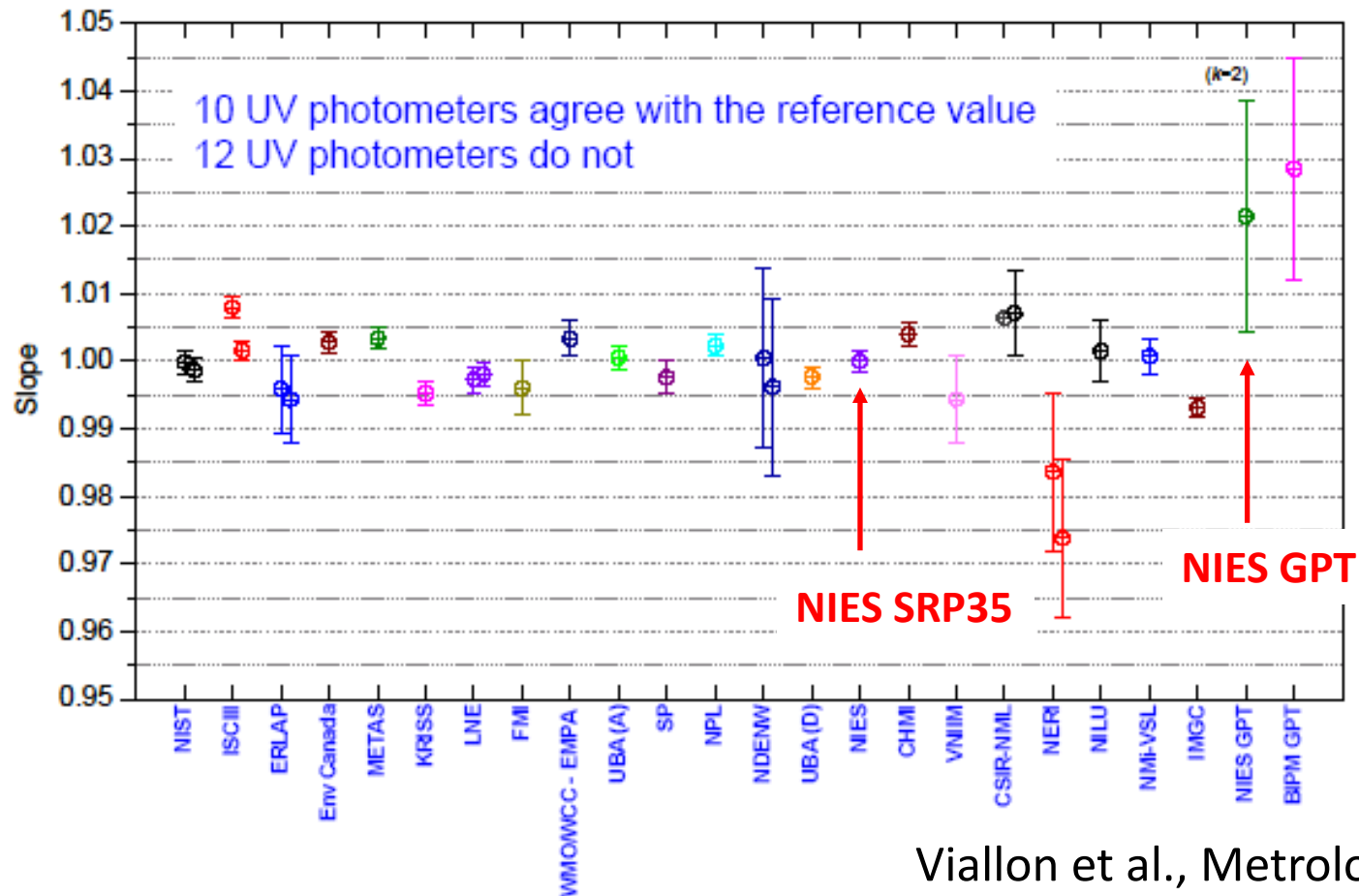
Stability of SRP35 & 47 against SRP 2



- Comparisons were made in 2004, 2008, 2013, 2015, and 2020 (every 2-4 years)
- The sensitivity changes are within 0.1%

CCQM-P28 results

degrees of equivalence - slopes



Viallon et al., Metrologia, 2006

Pursuing reliable standards

NIST SRP



- Measurement Range:
0 to 1000 nmol/mol (ppbv)

NIES GPT



- Measurement Range:
0 to 200 nmol/mol (ppbv)

Comparison of NIES GPT vs NIST SRP 35

