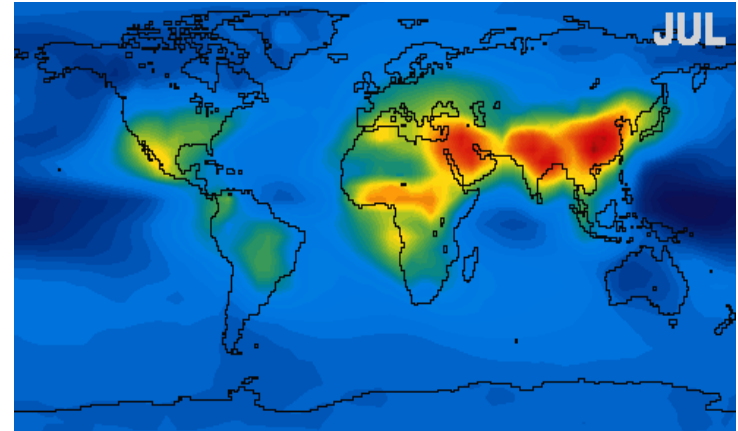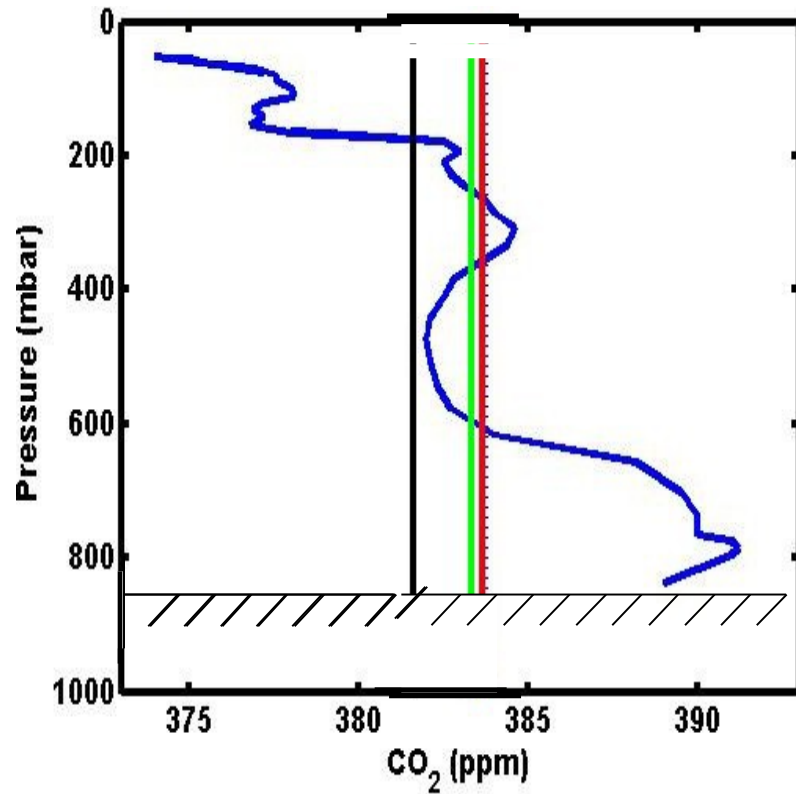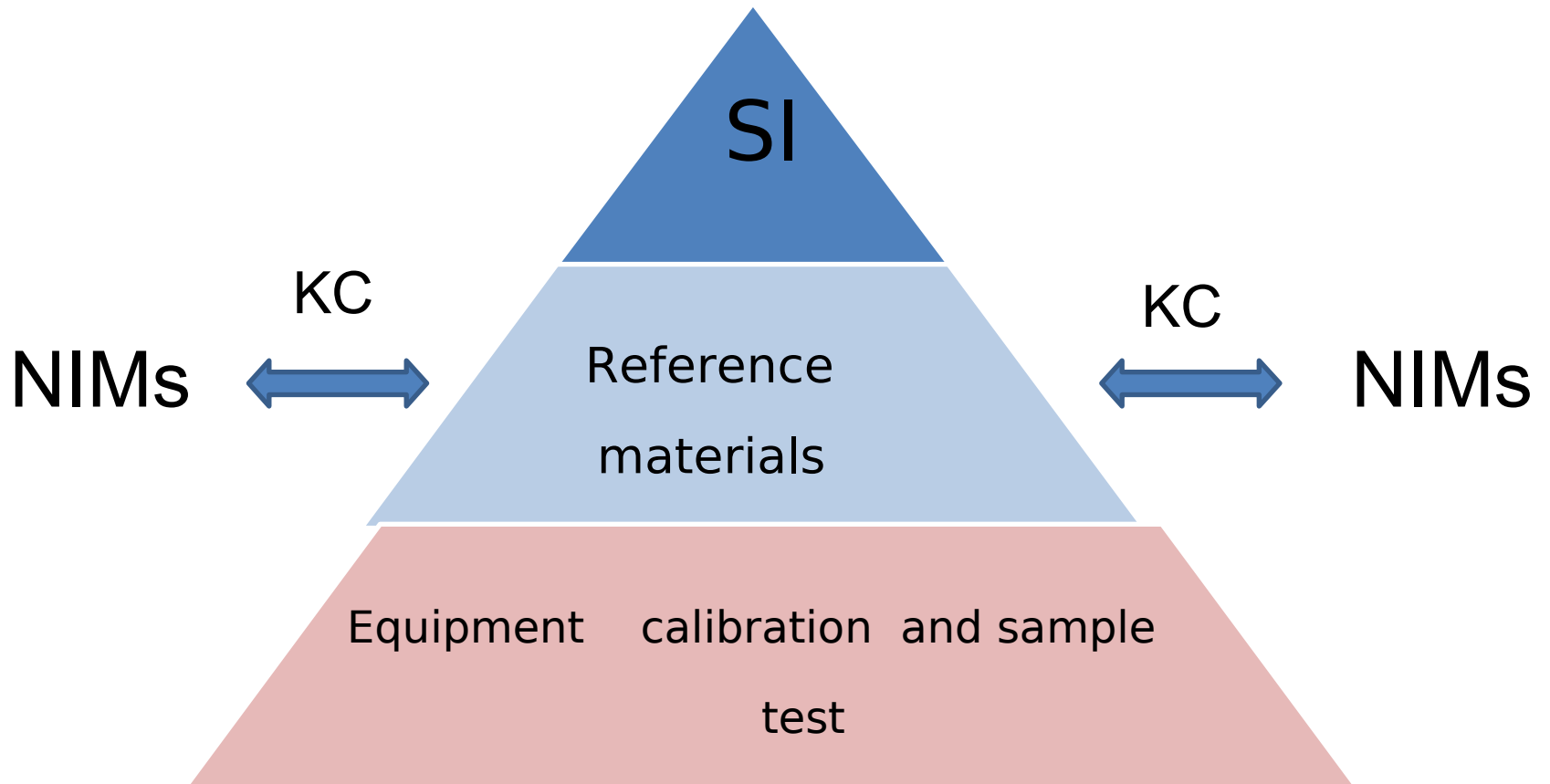# Build Traceability of Spectroscopic Absorption Constant for GHG

GHG measurements

- For space — satellite
- For region — Lidar
- For point — in situ
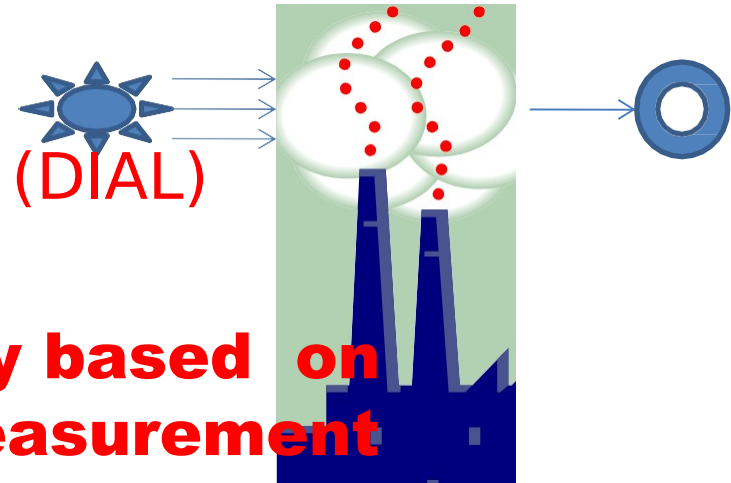
Traceability of measurement in situ

- It is difficult to prepare active gas reference materials in cylinder for example CH_2O, O_3, HNO_3

- The stability of low concentration level (ppb or ppt) RM in cylinder is not always satisfied, for example H_2S, NH_3, HCl

- Although dynamic method is a solution, it need a lot of work to keep the dynamic system stable and health

- KC at active gas and low concentration is a big challenge, because of hard preparation.

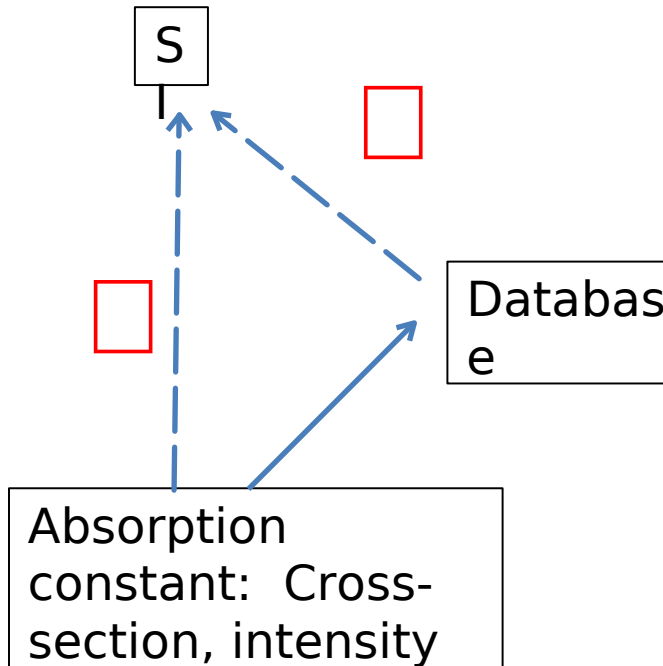- **It's not suitable to calibrate the open-path optical equipments by RM directly**

- **There is no gas cell in open-path measurement system**
  - —Remote Sensing (RS)
  - —Differential Absorption Lidar (DIAL)

- **Open-path system is usually based on absolute spectroscopic measurement (ASM)**

Beer's law is the basic principle

Traceable to what?

Traceable to length of m (FTIR) or time of s (CRDS)
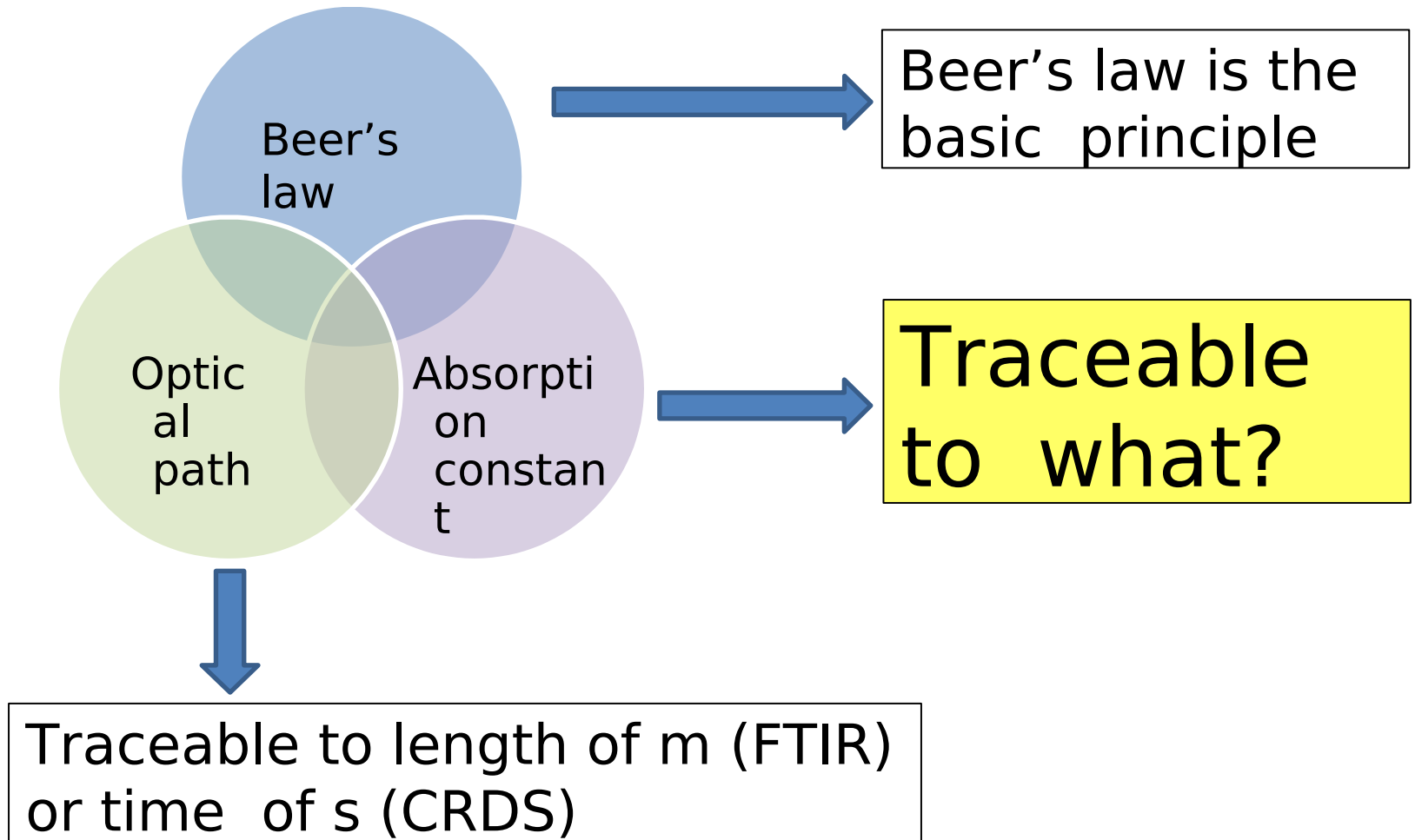
Traceability of database is not clear

S
I

Database

Absorption constant: Cross-section, intensity

- HITRAN
- GEISA Database
- Cologne Database for Molecular Spectroscopy (CDMS)
- SPECTRA – Institute of Atmospheric Optics, Tomsk, Russia
- Atlas of Very High Resolution Stratospheric IR Absorption Spectra,   University of Denver
- Atomic and Molecular Database for Astronomy

HITRAN need improved in uncertainty and accuracy

Dr. Laurence S. Rothman
Harvard-Smithsonian
Center for
Astrophysics
Atomic and Molecular
Physics Division
Cambridge, MA, USA
http://www.cfa.harvard
. edu/hitran

- HITRAN stands for HIgh-resolution TRANsmission molecular absorption database

- HITRAN is like the human genome of gasses, if you will. And over the years, an unbelievable **number of applications were developed to make use of it.**

- **We want to know the intensities to better than two percent.**

- **We need to put more molecules in. We need to cover more of the spectral region. We need even more accuracy.**

If accurate and traceable absorption constant is available, it can be primary standard in the traceability system

Constant is more stable than PRM

SI

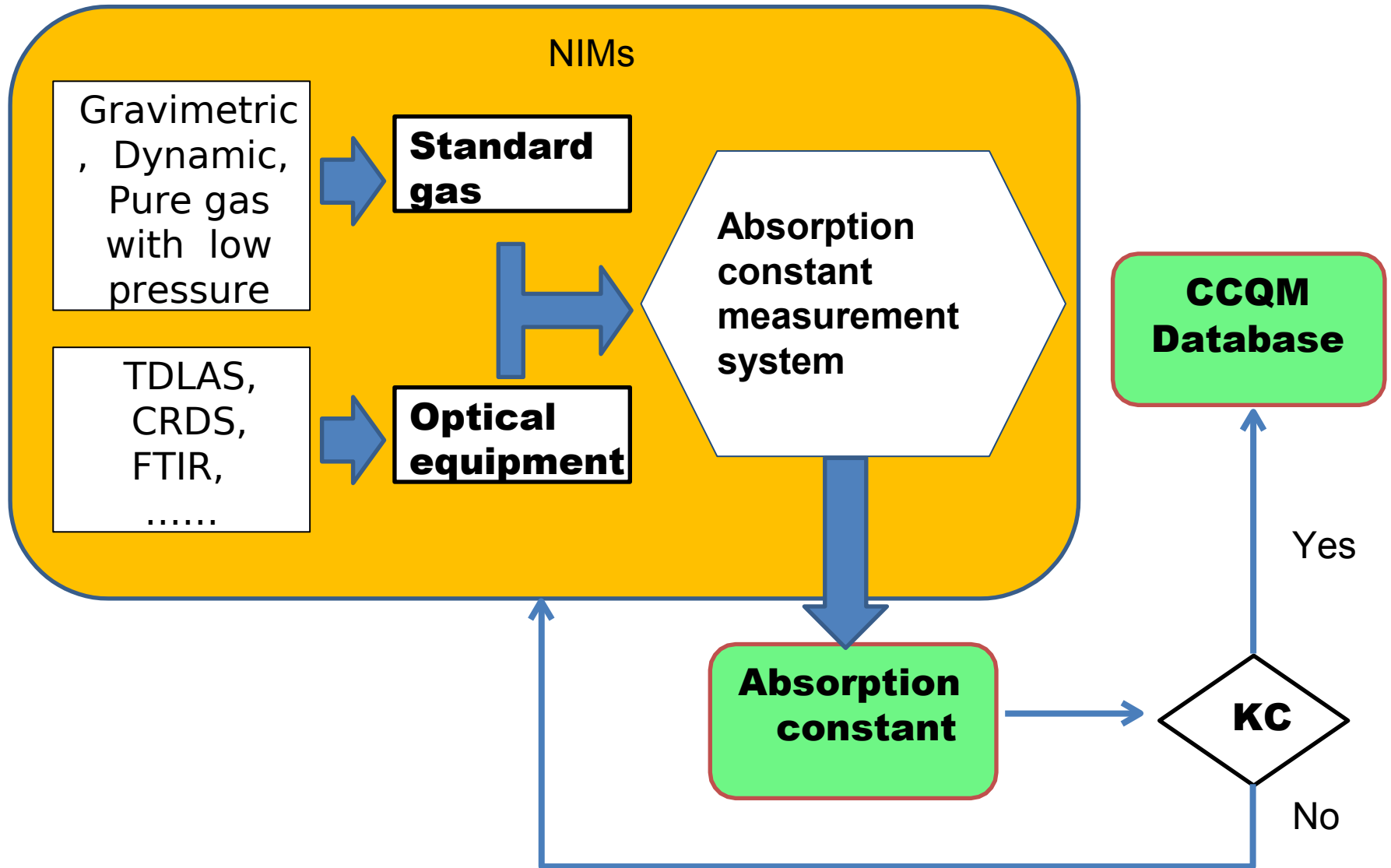Primary standard: absorption cross-section, intensity

Be used in ASM

Accurate measurement of unstable or low concentration components

Provide traceability for measurement of open-path optical methods

KC of absorption constant

Save money, save time and save transportation

Researching route in NIMs and CCQM

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Conclusion

1. It is suggested to do research on traceable spectroscopic absorption constant by NIMs.

2. An accurate and traceable database on gas absorption constant is suggested to be built under CCQM.

Thanks for your attention!