2017 ESO Calibration Workshop:

The second generation VLT instruments and friends

Molecular Line Parameters & VAMDC

an atmospheric/laboratory physicist point of view

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on the campus JUSSIEU

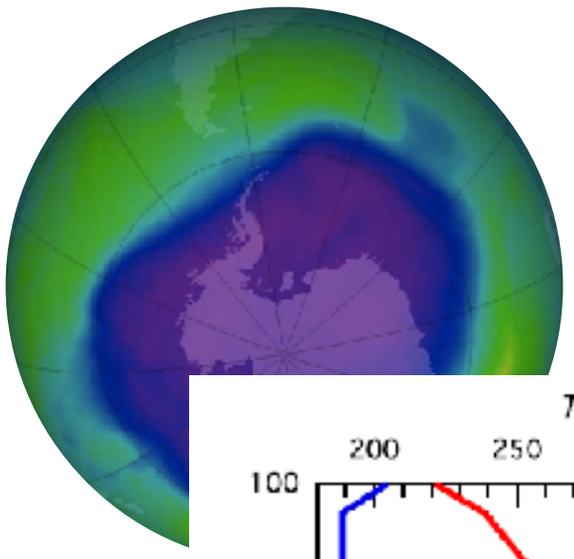
The SMILE group

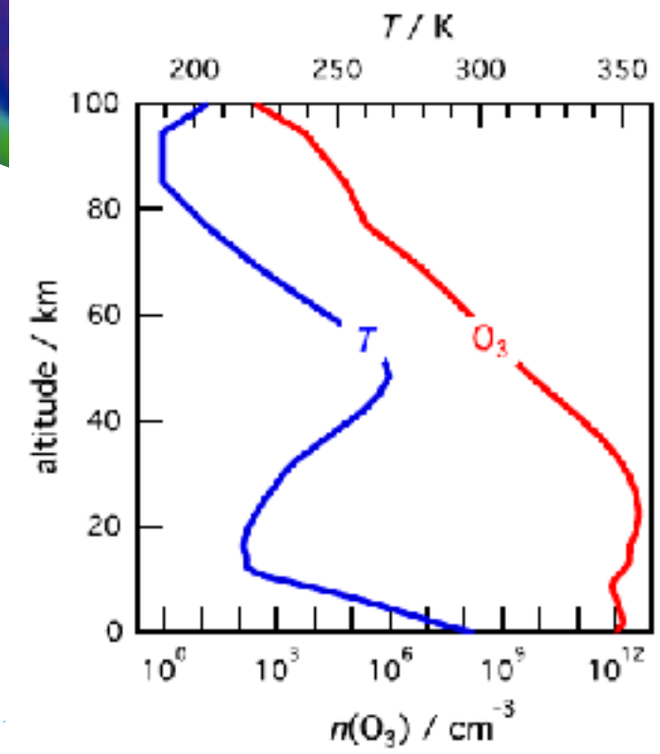
Spectroscopie Moléculaire et Instrumentation Laser pour l'Environnement

- (High Resolution) Molecular Spectroscopy
- Remote Sensing
- Chemical Kinetics & Atmospheric Chemistry

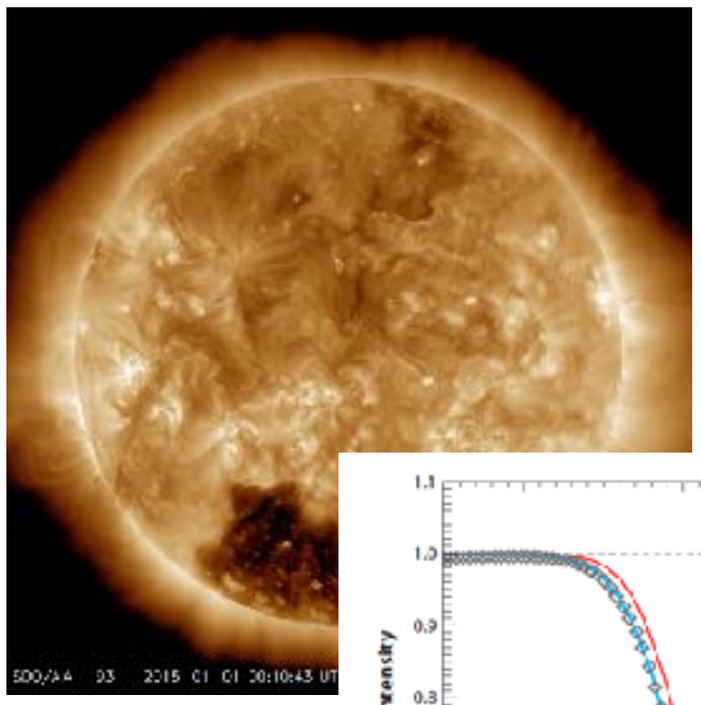
Phys. Conditions

T ~ 200 - 300 K

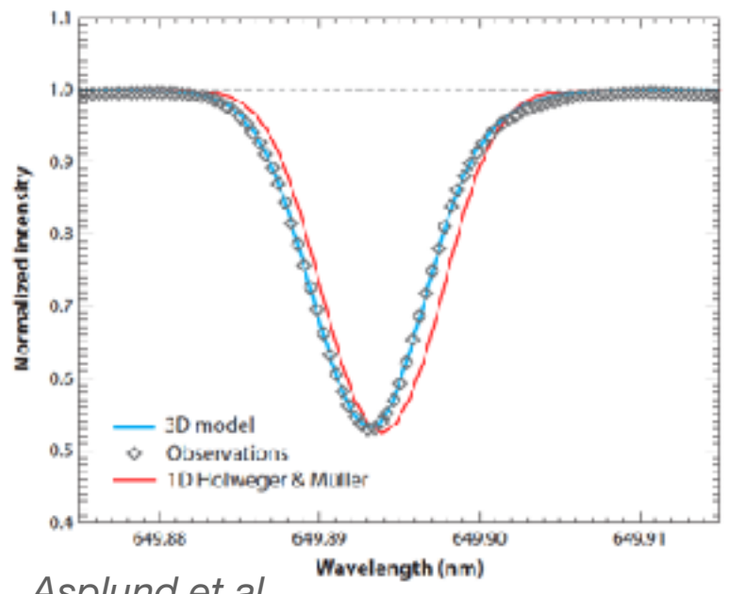




credits NASA



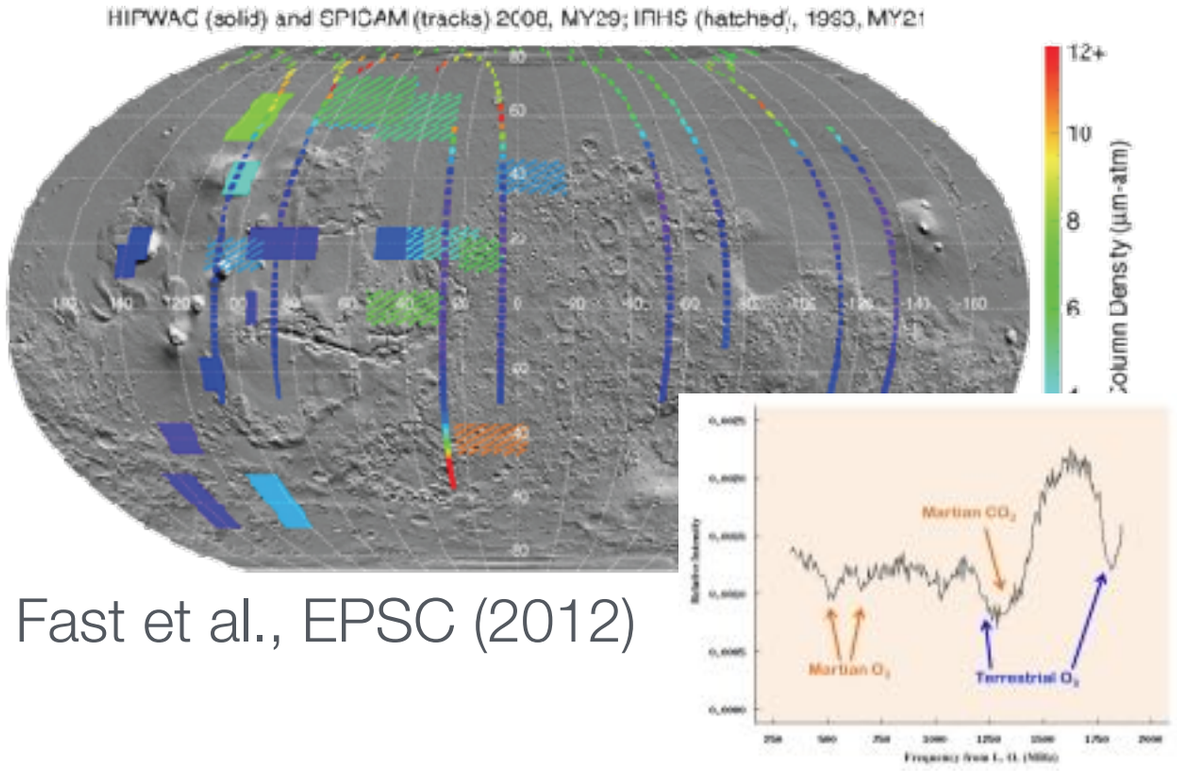
T ~ 6000 K



Asplund et al.
Ann Rev Astron Astrophys ***47,*** *481 (2009)*

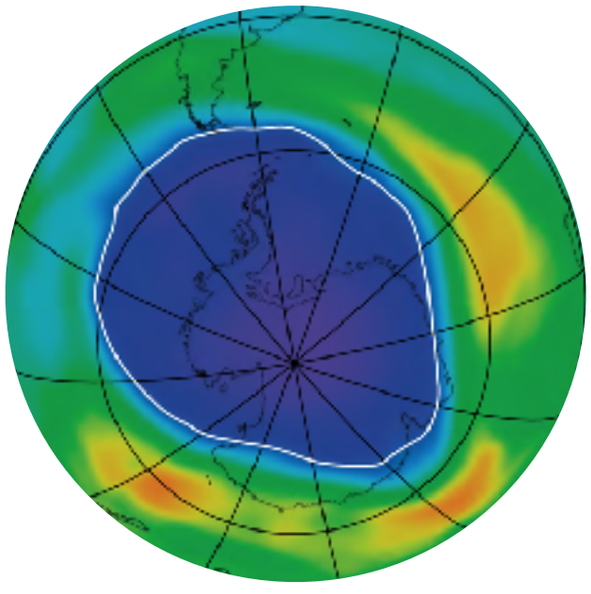
Ozone in the solar system

Pollution

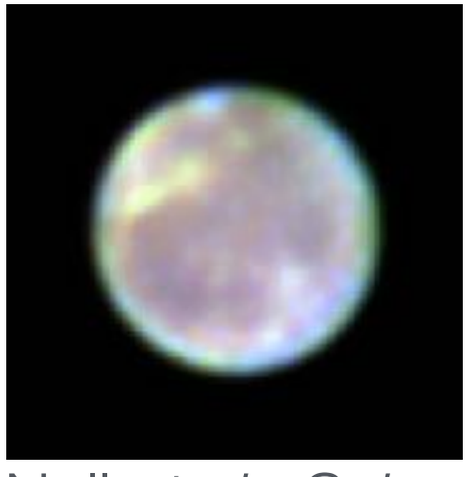


Fast et al., EPSC (2012)

Ozone hole



From *Scientific Assessment of Ozone Depletion* (2014)

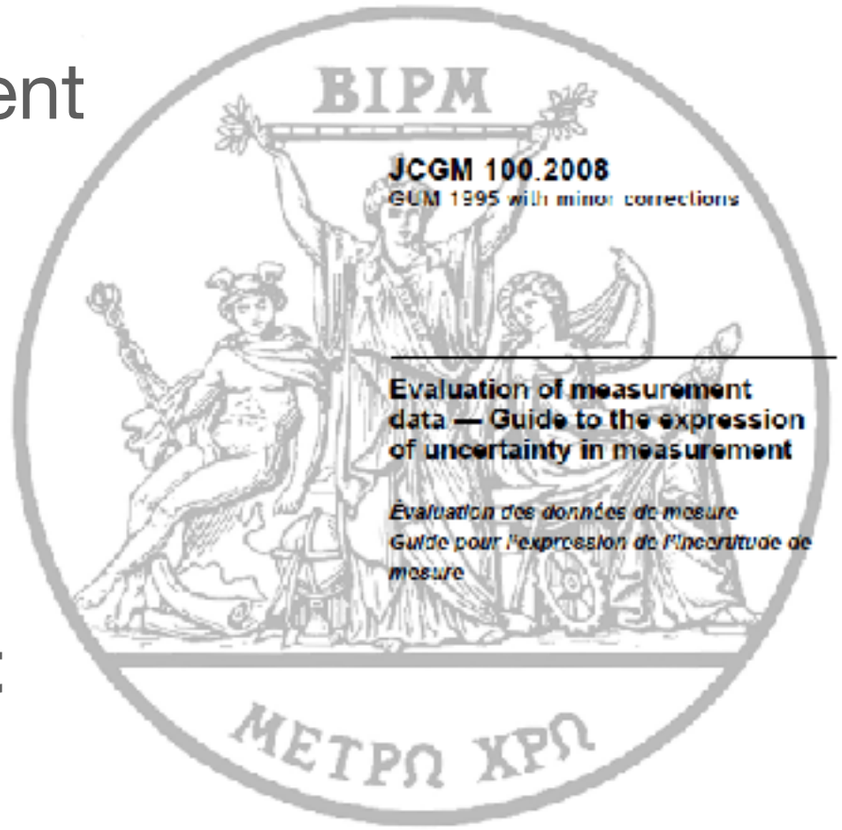


Planetary bodies

Noll *et al., Science* **273** (1996)

Metrology

- "Science of measurement"
- GUM - Guide to the Expression of Uncertainty in Measurement
  - Uncertainty is integral part of measurement
  - Need common rules
  - **Assure traceability**
    - (link to primary standards)
  - **Provide (complete) uncertainty budget**

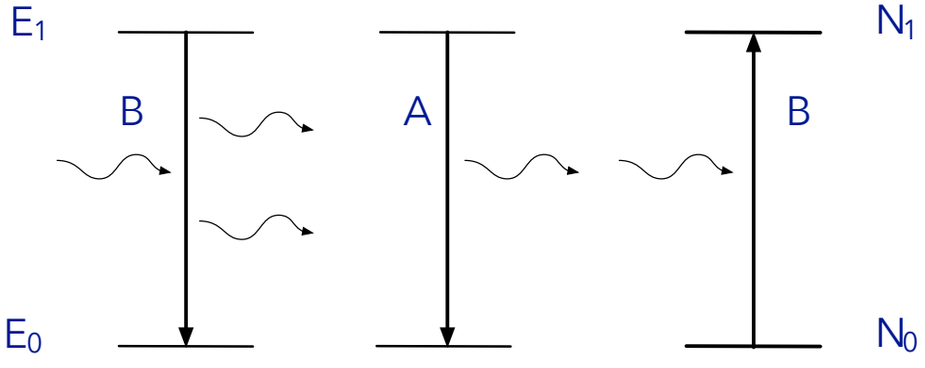


Outline

- Introduction :
  - A phenomenological primer on molecular line parameters
  - Problems associated with spectroscopic data of ozone
- Multispectral Measurements (FTS & TDL): UV, 5 and 10 µm, incl. pressure shifting using QCLs
- The VAMDC infrastructure as ressource of molecular data (*presentation of work by M.L. Dubernet, C.M. Zwölf, N. Moreau, and Y.A. Ba*)

Molecular Line Parameters

- weak field / linear absorption



- resolved ro-vibrational transitions

$$S_{\eta\eta'} = \frac{h\nu_{\eta\eta'}}{c}\frac{n_\eta}{N}\left(1 - \frac{g_\eta n_{\eta'}}{g_{\eta'} n_\eta}\right) B_{\eta\eta'}$$

- cross section of ind. transition

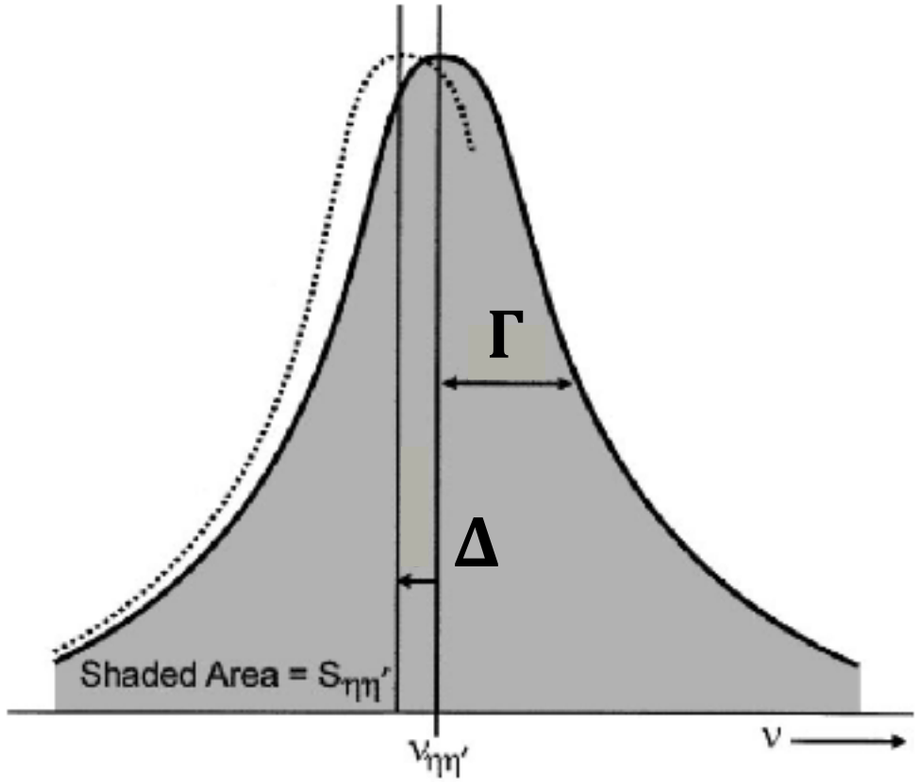
$$S = \int \sigma(\nu)\, d\nu$$

$$\sigma(\nu) = S \times f(\nu)$$

- use semi-empirical formulae for line-shape & parameters

$$\Gamma_L/p = \gamma(T) = \gamma_0(T_{ref})\left(\frac{T}{T_{ref}}\right)^n$$

$$\Delta_L/p = \delta(T) = \delta_0(T_{ref}) + \delta'(T - T_{ref})$$



adapted from Rothman et al.,
J Quant Spectrosc. Radial. Trans. **60**, 1998

Molecular Line Parameters

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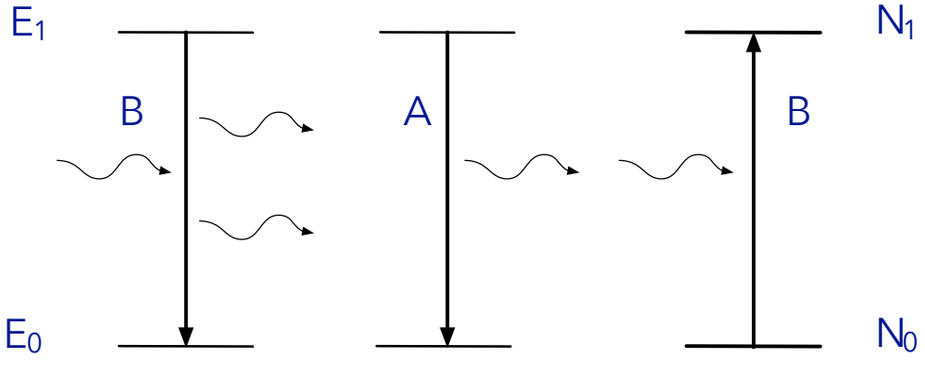

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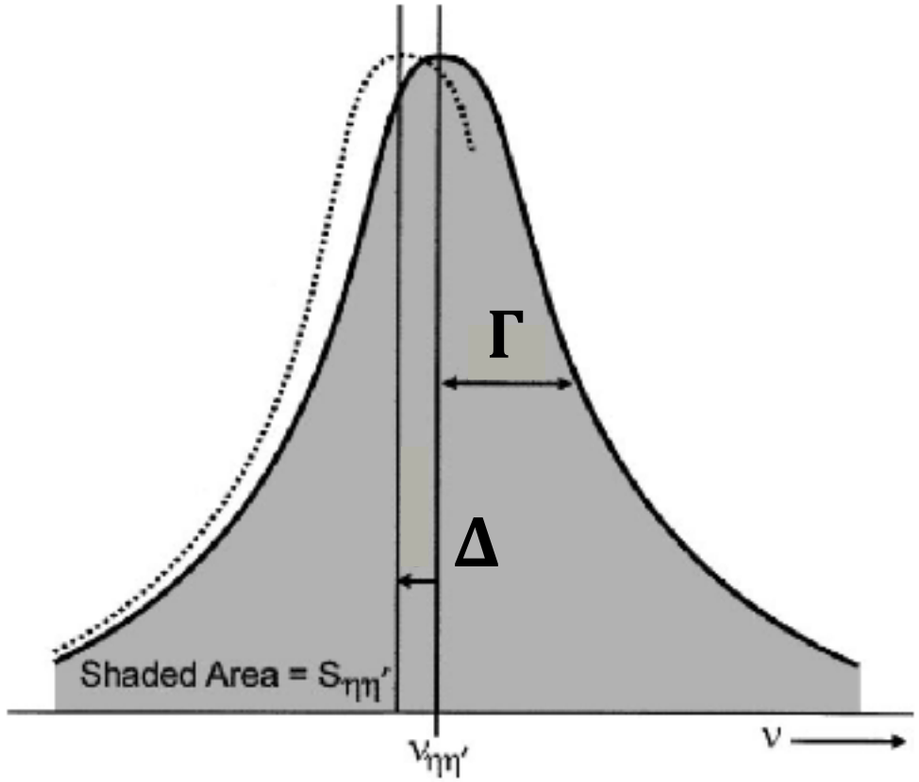
- cross section of ind. transition

$$S = \int \sigma(\nu)\, d\nu$$

$$\sigma(\nu) = S \times f(\nu)$$

- most commonly used: Voigt

$$\mathcal{V} = \int \mathcal{G}(\Gamma_D, \nu)\mathcal{L}(\Gamma_L, \nu' - \nu)\, d\nu'$$



adapted from Rothman et al.,
J Quant Spectrosc. Radial. Trans. **60**, 1998

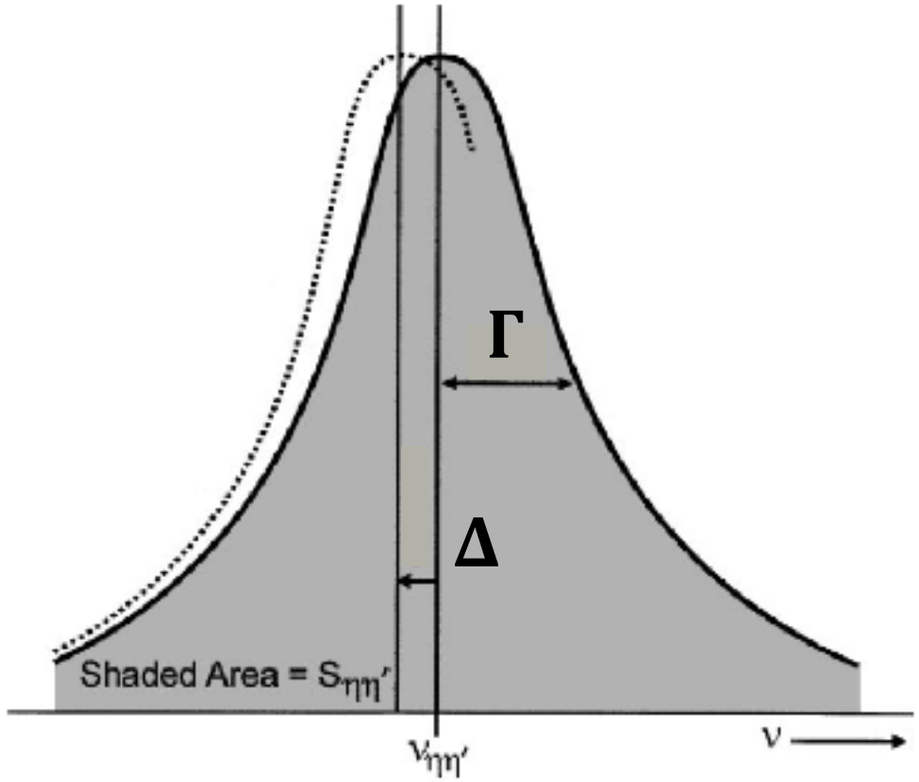
Molecular Line Parameters

- weak field / linear absorption
- most commonly used: Voigt

High resolution spectroscopy reveals limits of Voigt profile
Preparation for more general line shape model
(Dicke effect, velocity and phase changing collisions, ….):

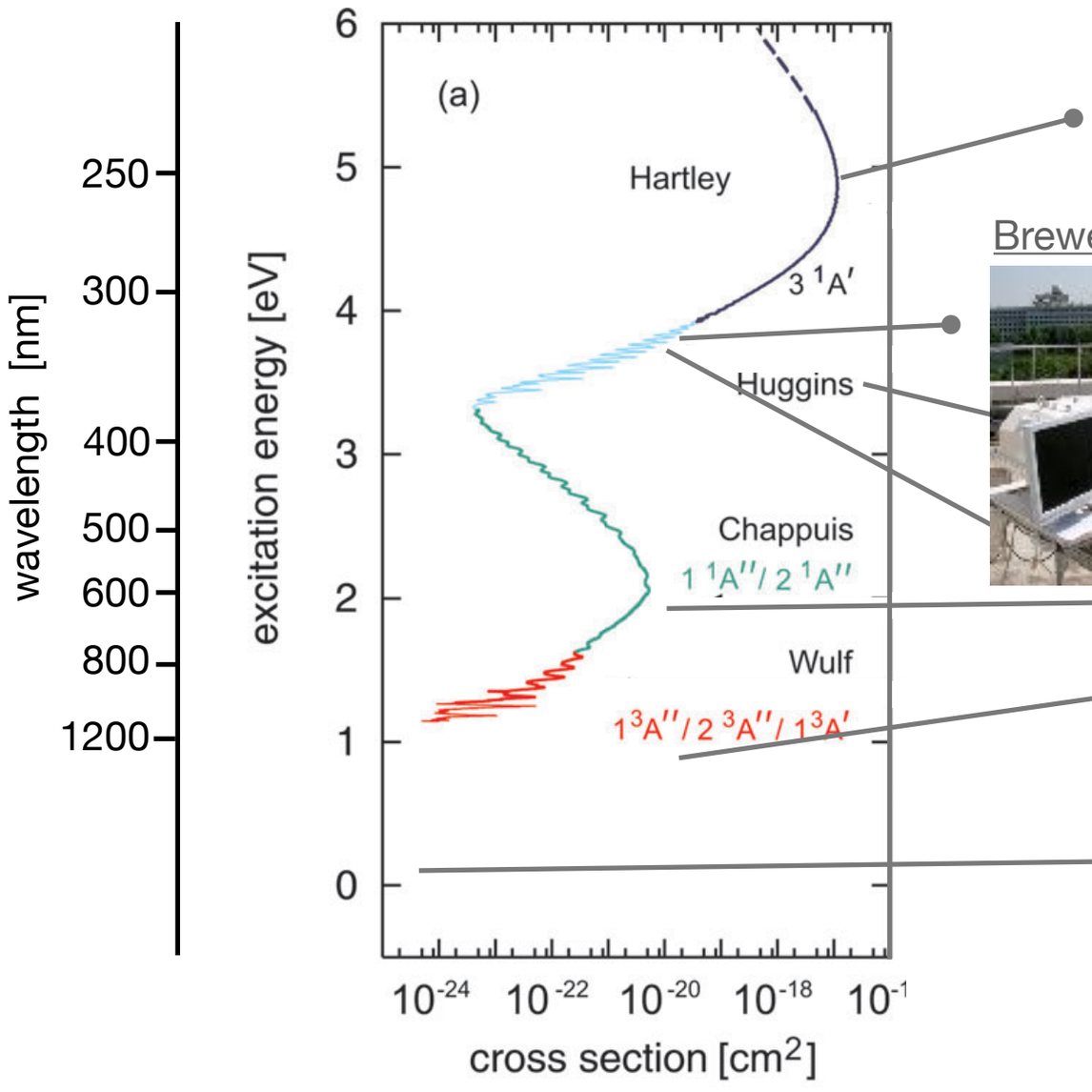
$$HTP(\Gamma_D, \Gamma_0, \Delta_0, \Gamma_2, \Delta_2, \nu_{VC}, \eta; \Delta\nu)$$

eg Wcisło et al., *J Quant Spectrosc. Radial. Trans.* **177**, 75 (2016)



adapted from Rothman et al.,
J Quant Spectrosc. Radial. Trans. **60**, 1998

Ozone Spectroscopy & Measurement



ambient O_3 analyser

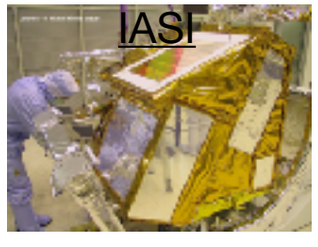
$$\ln\left(\frac{I}{I_0}\right) = -\sigma \cdot l \cdot n$$

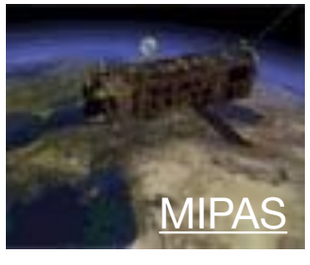
Brewer-Dobson

LIDAR

SCIAMACHY & GOMOS

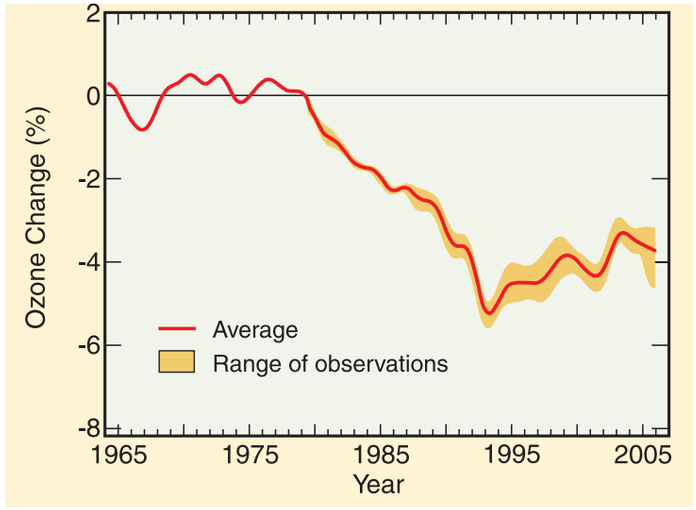
IASI





Ozone Spectroscopic Data Quality

- target uncertainty : < 1%



Scientific Assessment of Ozone Depletion 2010, WMO

- Inconsistencies in atmospheric & laboratory data (+ data bases)
  - Lab: IR (10 µm / 1000 cm^{-1}) - UV (300 nm):
    - 5.5 % (Picquet-Varrault et al., 2005) &
    - 4.0 (± 0.1)% (Gratien et al., 2010)
  - Column-O_3: FTIR (962 -1044 cm^{-1}) - Brewer (303.2 - 320.1 nm) @ Izaña:
    - 4.2 ± 0.7 % (*e.g.* Viatte et al., *Atmos. Meas. Tech*. **4**, 2011)

Atmos. Meas. Tech. Discuss., 7, 2071–2106, 2014
www.atmos-meas-tech-discuss.net/7/2071/2014/
doi:10.5194/amtd-7-2071-2014

Atmospheric Measurement Techniques Discussions

Quality assessment of ozone total column amounts as monitored by ground-based solar absorption spectrometry in the near infrared (> 3000 cm^{-1})

O. E. García[1], M. Schneider[1,2], F. Hase[2], T. Blumenstock[2], E. Sepúlveda[1,3], and Y. González[1]

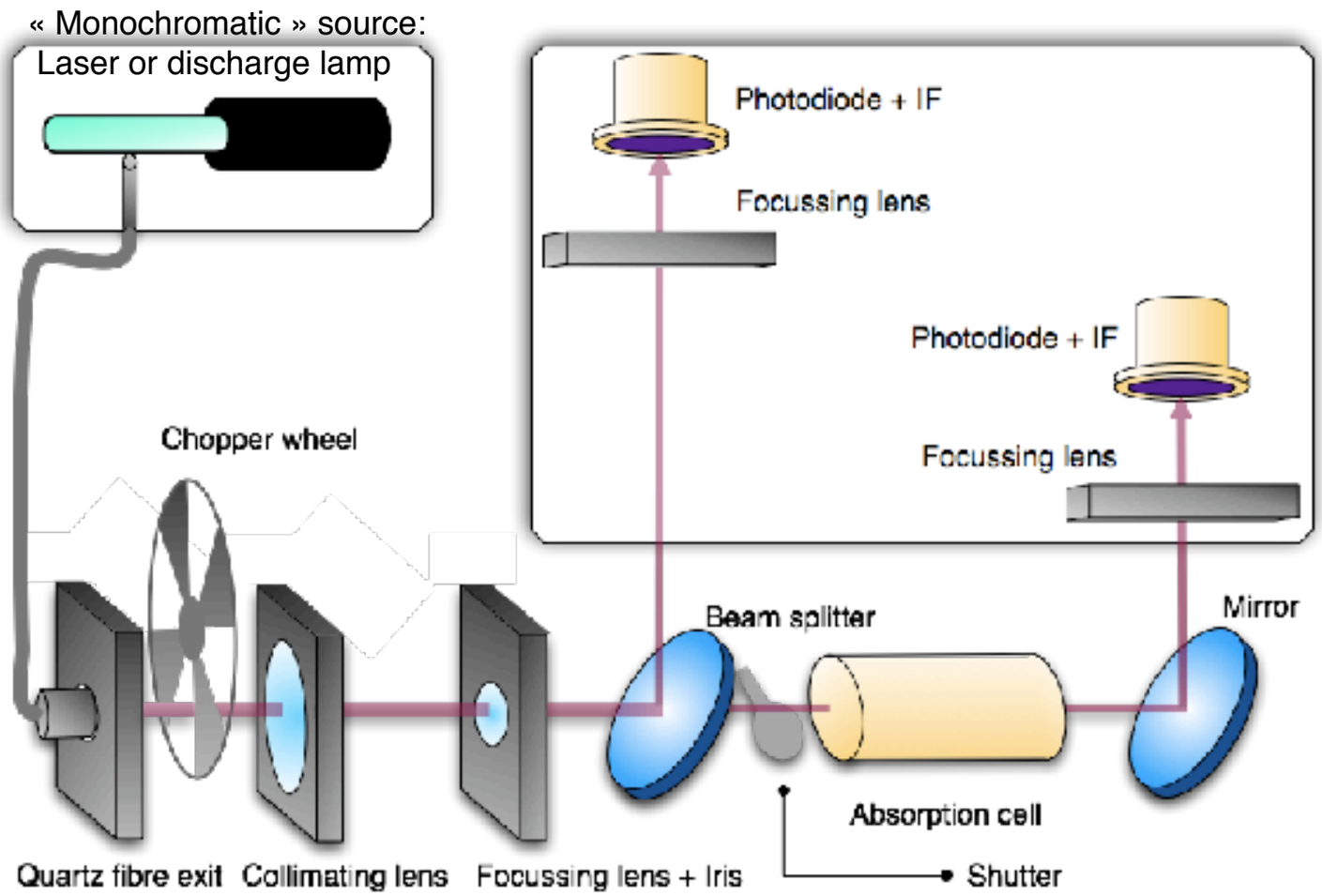
Rel. retrieval bias using recommended data

	UV	VIS	3 µm	5 µm	10 µm	14 µm
UV					-4%	
VIS				0 ?		
3 µm					7 %	
5 µm		0 ?			?	
10 µm	4%		-7%	?		?
14 µm					?	

3. How do other ranges compare ?

Reference values at selected wavelengths with metrological quality

Cross section @ 253/325 nm

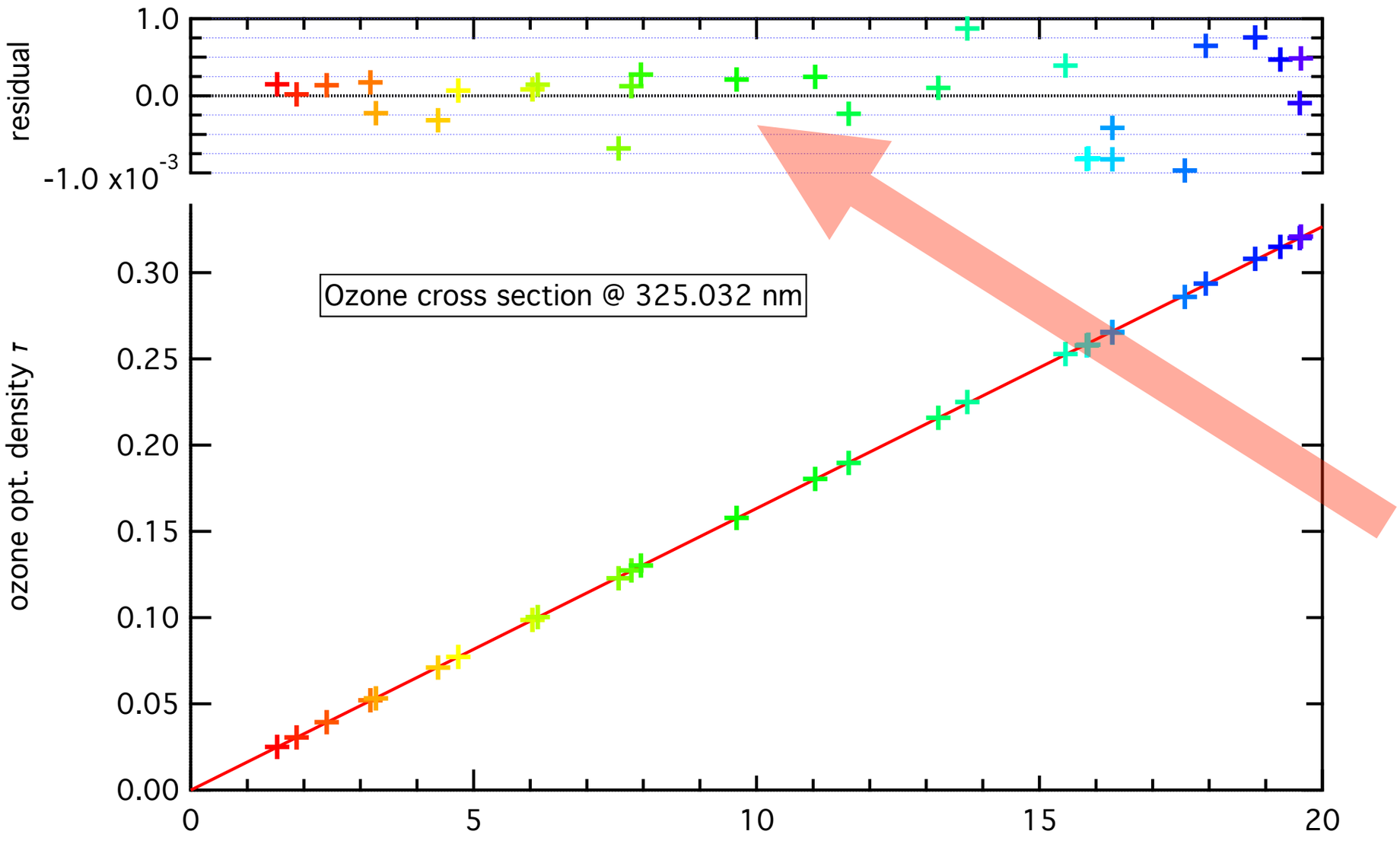


”Resolving power” ~ 3 10^6

$$\ln\left(\frac{I_0}{I}\right) = \sigma \cdot L \cdot n \quad \Rightarrow \sigma = \frac{k_B T}{\underbrace{(1 - x_c - x_{nc})p}_{n^{-1}}} \cdot L^{-1} \cdot \ln\left(I_0/I\right)$$

UV measurements @ 325 nm

Preliminary results

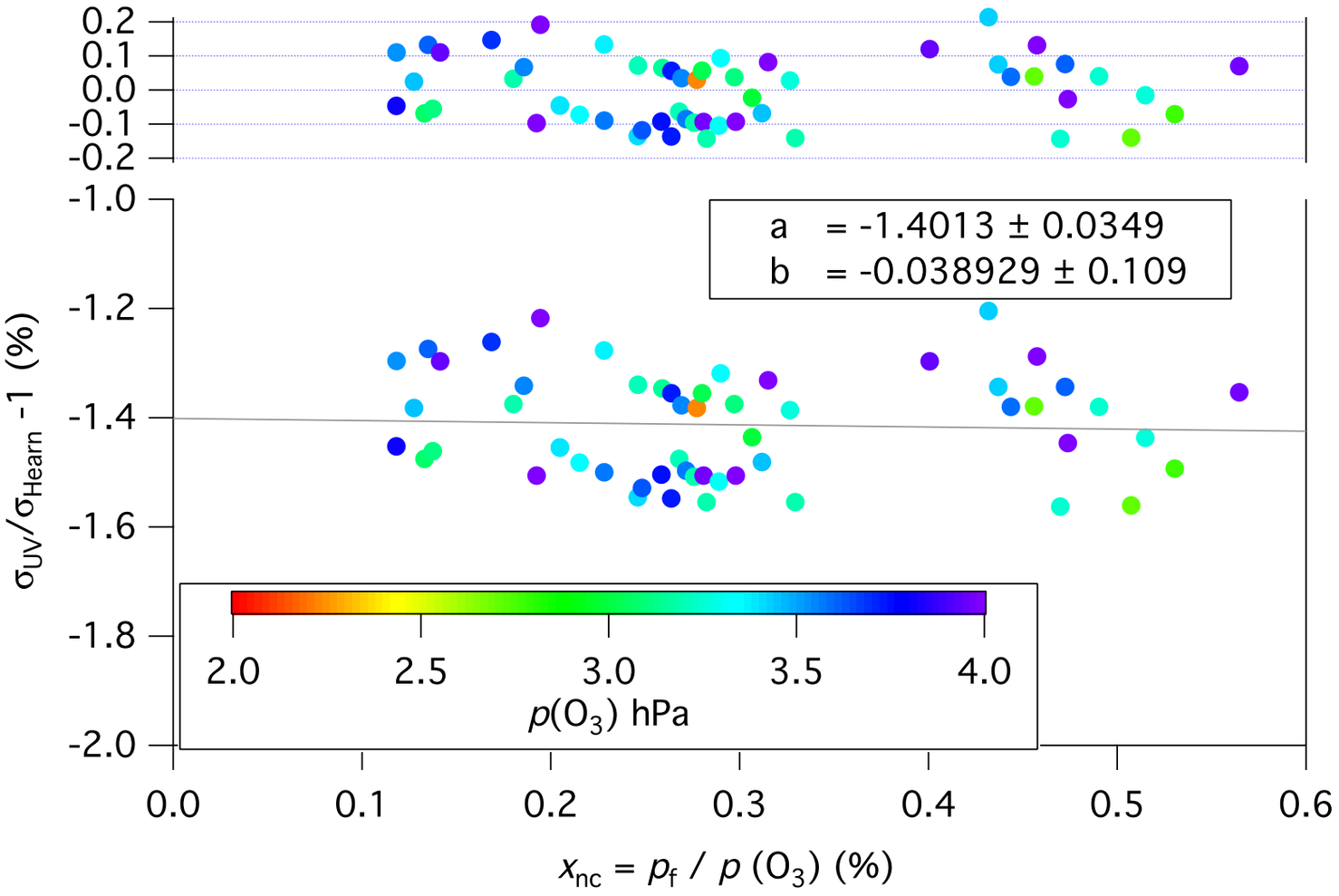


N = 28

weak scatter
⇒ u(σ) < 0.5 %

collaboration J Gröbner/ Phys. Met. Obs. Davos
EMRP - JRP ENV59 ATMOZ

UV measurements @ 253 nm



$N = 55$

$$\sigma_{\text{LERMA}} = (1.131 \pm 0.7\%) \cdot 10^{-17}\ \text{cm}^2$$

$$\sigma_{\text{Hearn/BIPM}} = (1.148 \pm 2.1\%) \cdot 10^{-17}\ \text{cm}^2$$

(officially recommended)

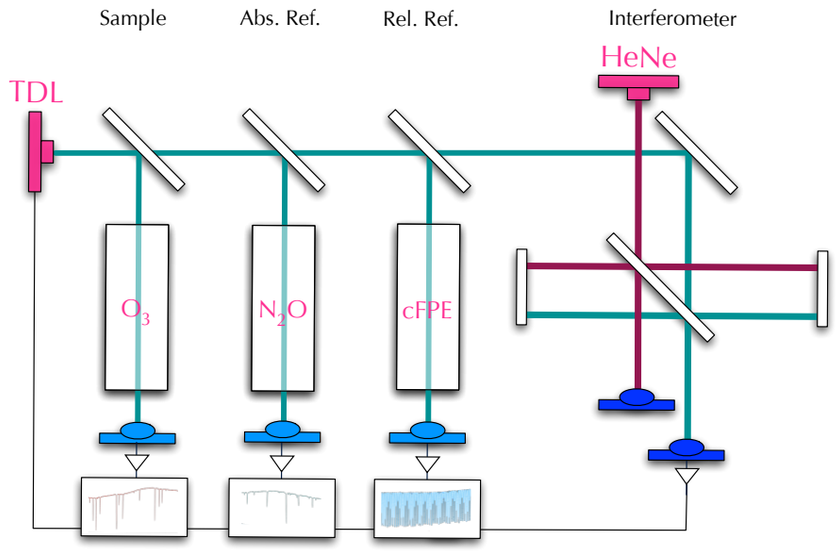
$$\sigma_{\text{Viallon/BIPM}} = (1.127 \pm 0.9\%) \cdot 10^{-17}\ \text{cm}^2$$

Viallon et al., *AMT*, **8**, 2015

High resolution study of individual molecular line transitions (almost metrological quality)

IR studies at LERMA

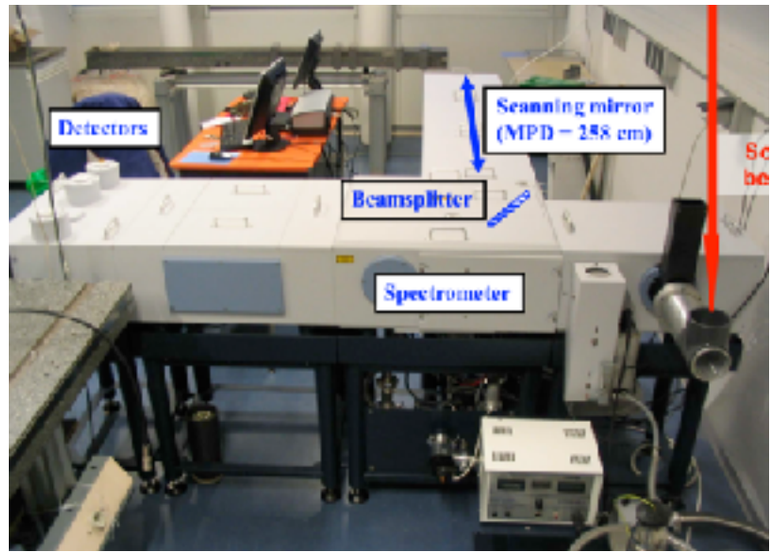
Lab: Interferometrically controlled tunable TDL (R ~ 10^8)



- *high spectral resolution (**< 5 x 10^{-8}**)*
- *interferometer based stabilization*
- ***1 out of 2 systems** explicitly mentioned for spectroscopy on future satellite missions (Harrison et al., JQSRT **112,** 2011)*

*Guinet et al. JQSRT **110**, 2010*

Atmosphere: FTS-Paris (R ~ 10^6)

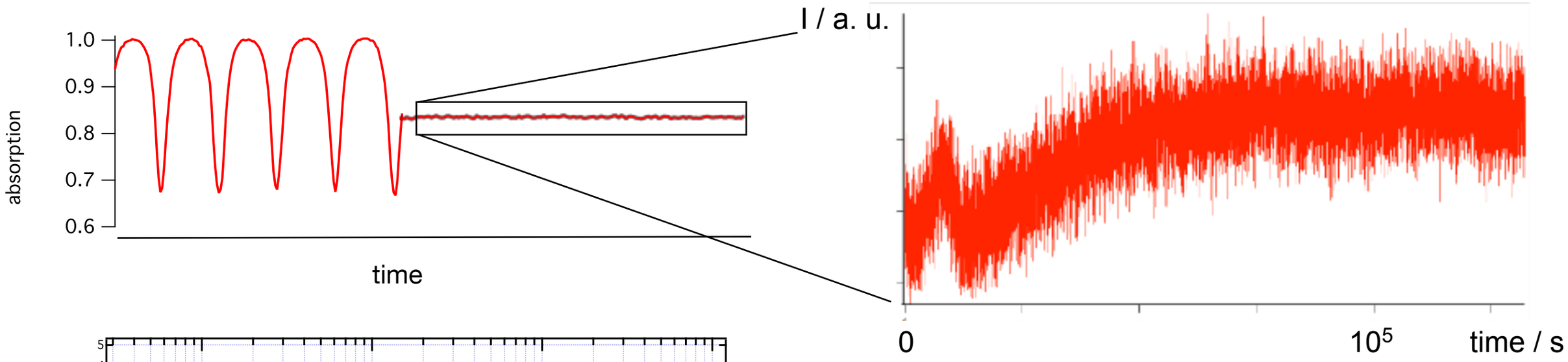


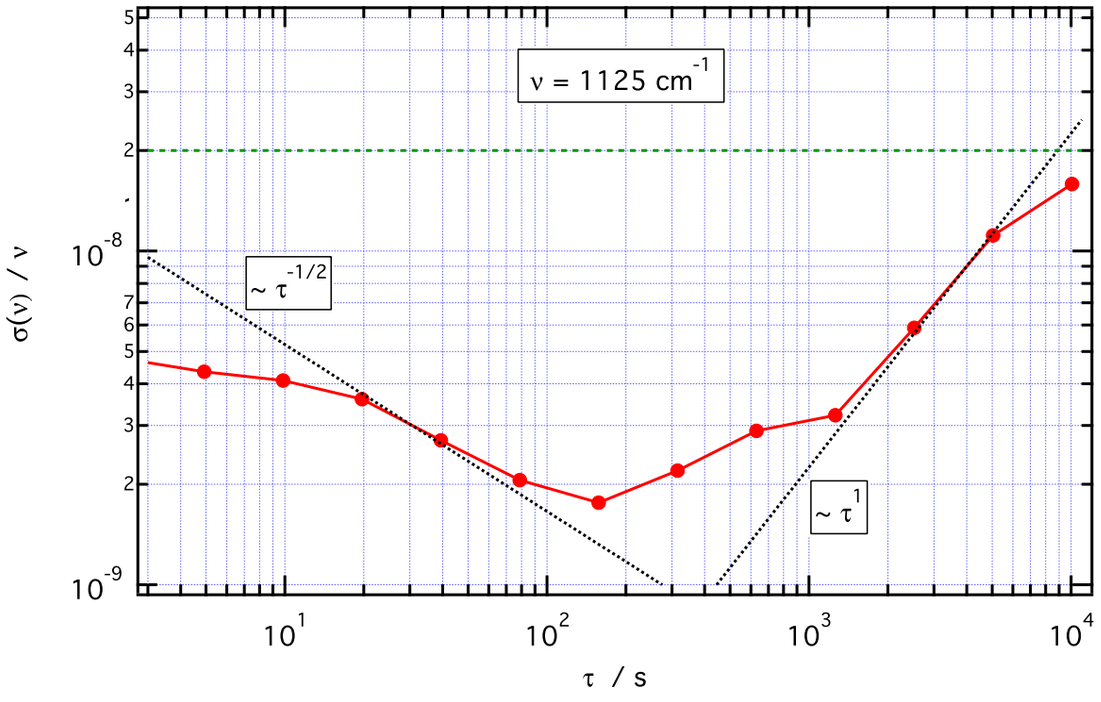
- *ground based FTS, part of the air quality research station of UPMC at Paris*
- *Bruker HR125, resolution: **0.0024 cm^{-1}***
- *MCT and InSb detectors: access to **950-1400 cm^{-1}** and **1950-3200 cm^{-1}***

*Té et al. RSI **81**, 2010*

Frequency stabilization

$$D = k_d \lambda_d = k_{\mathrm{HeNe}}\, \lambda_{\mathrm{HeNe}}$$





$\Delta\nu/\nu = 5 \cdot 10^{-9}$ (½ h)

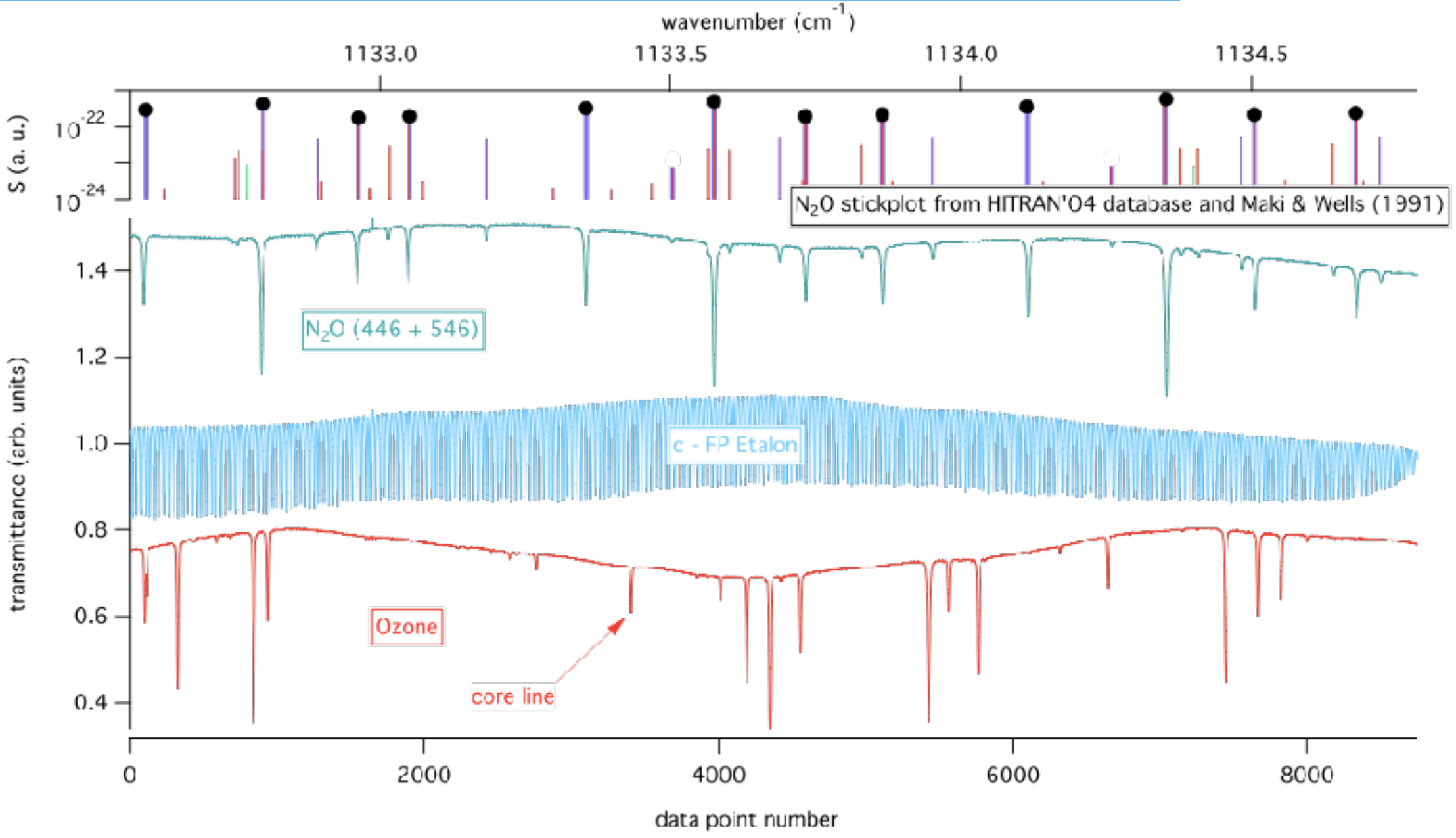
$\Delta\nu/\nu = 1 \cdot 10^{-8}$ (1h)

$\Delta\nu/\nu = 2 \cdot 10^{-8}$ (3h)

compare to:

- 10^{-6} FTIR

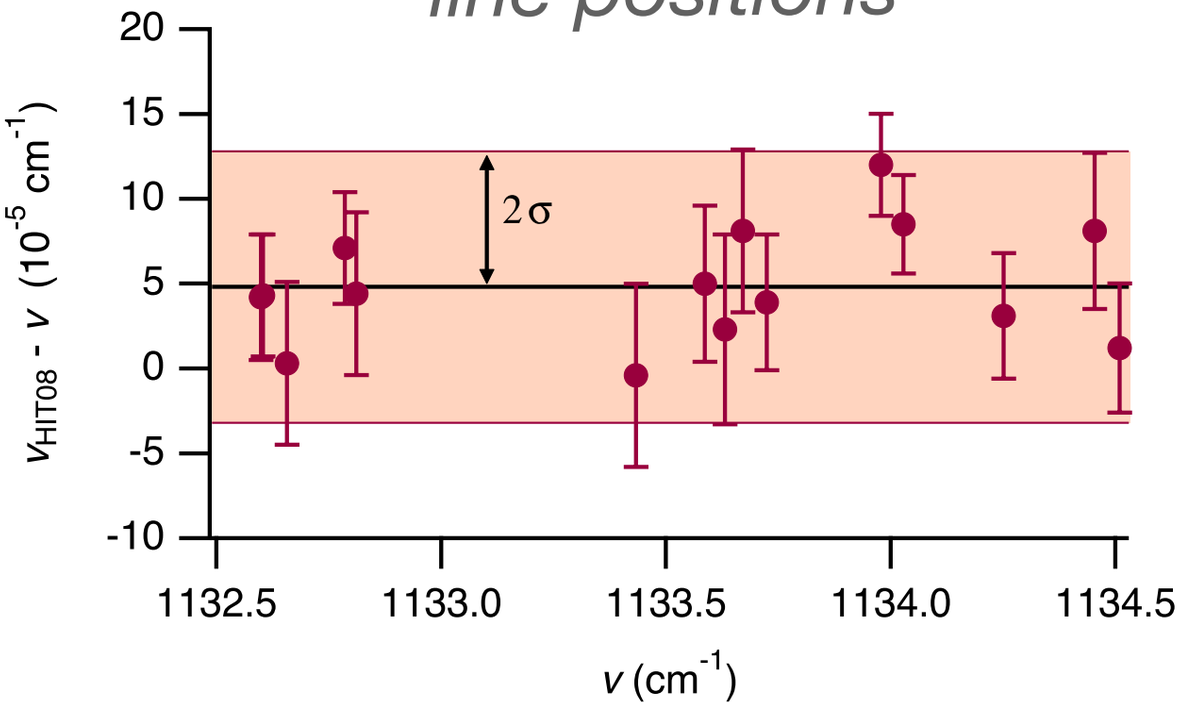
Spectra Acquisition and the Wavenumber Scale



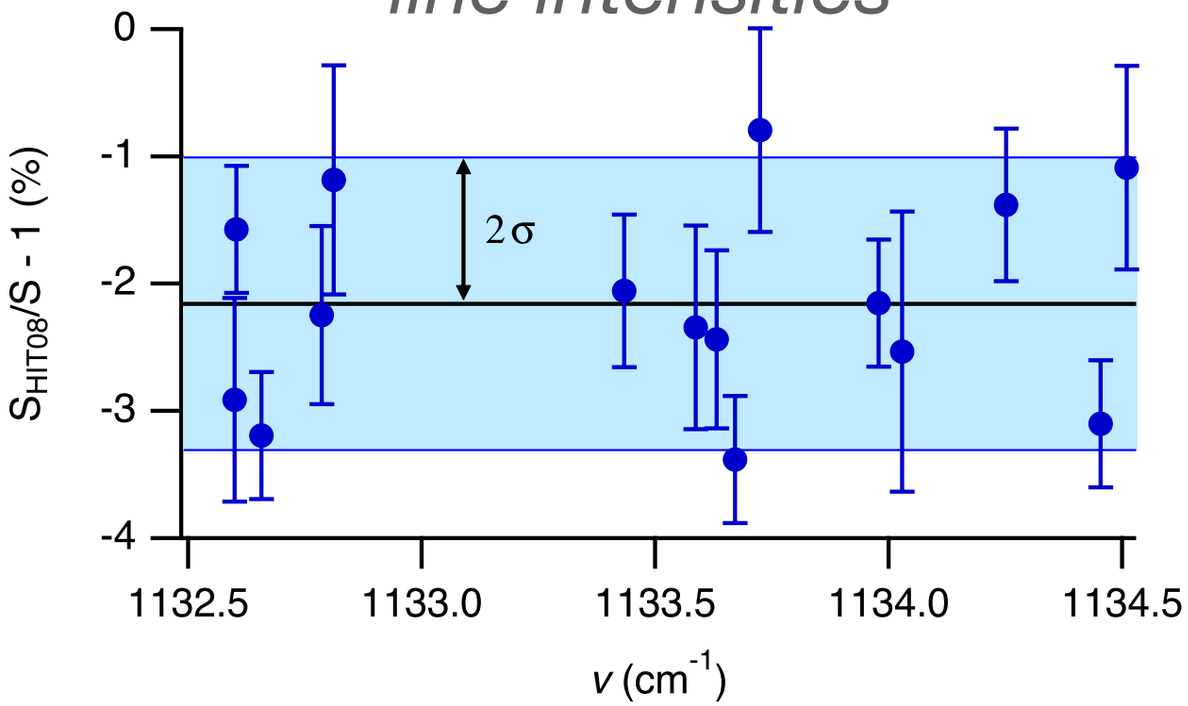
Summary IR Spectroscopy in SWIFT Target Window

Analysis of 15 strong absorption lines in small spectral window

line positions

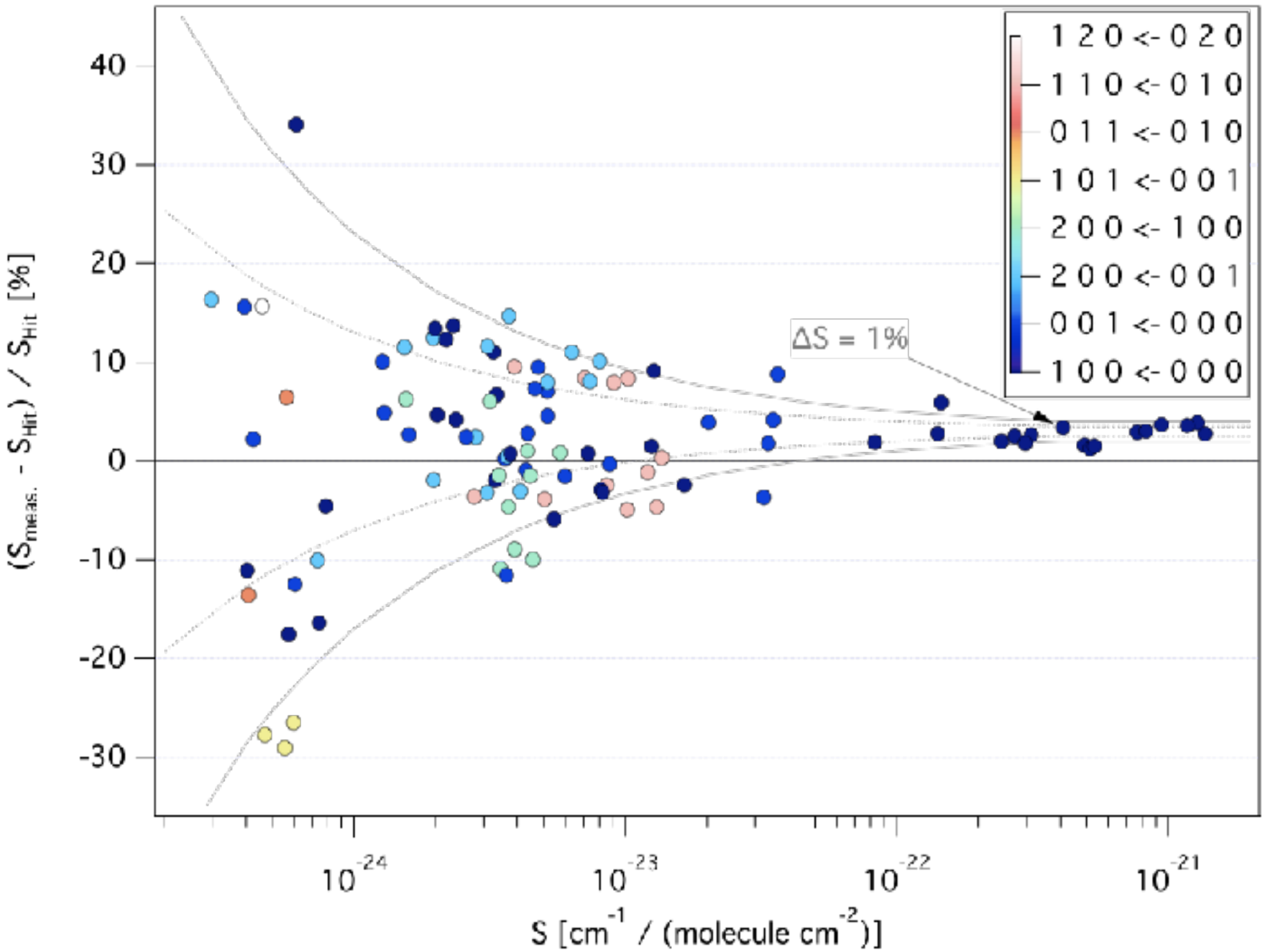


line intensities



*Guinet et al. JQSRT **110**, 2010*

Intensities at 1130 cm^{-1}



UV - IR (10 µm) data consistency

- Confirm ~ **4% discrepancy** between UV and IR
- Both regions seem to require correction
- UV (253.7 nm): **-1.4 %**
- IR (10 µm): **+ 2.1 %**

5 & 10 µm regions

Field observations & validation of database

Sensitivity to bias in line parameters

- sensitivity coefficient

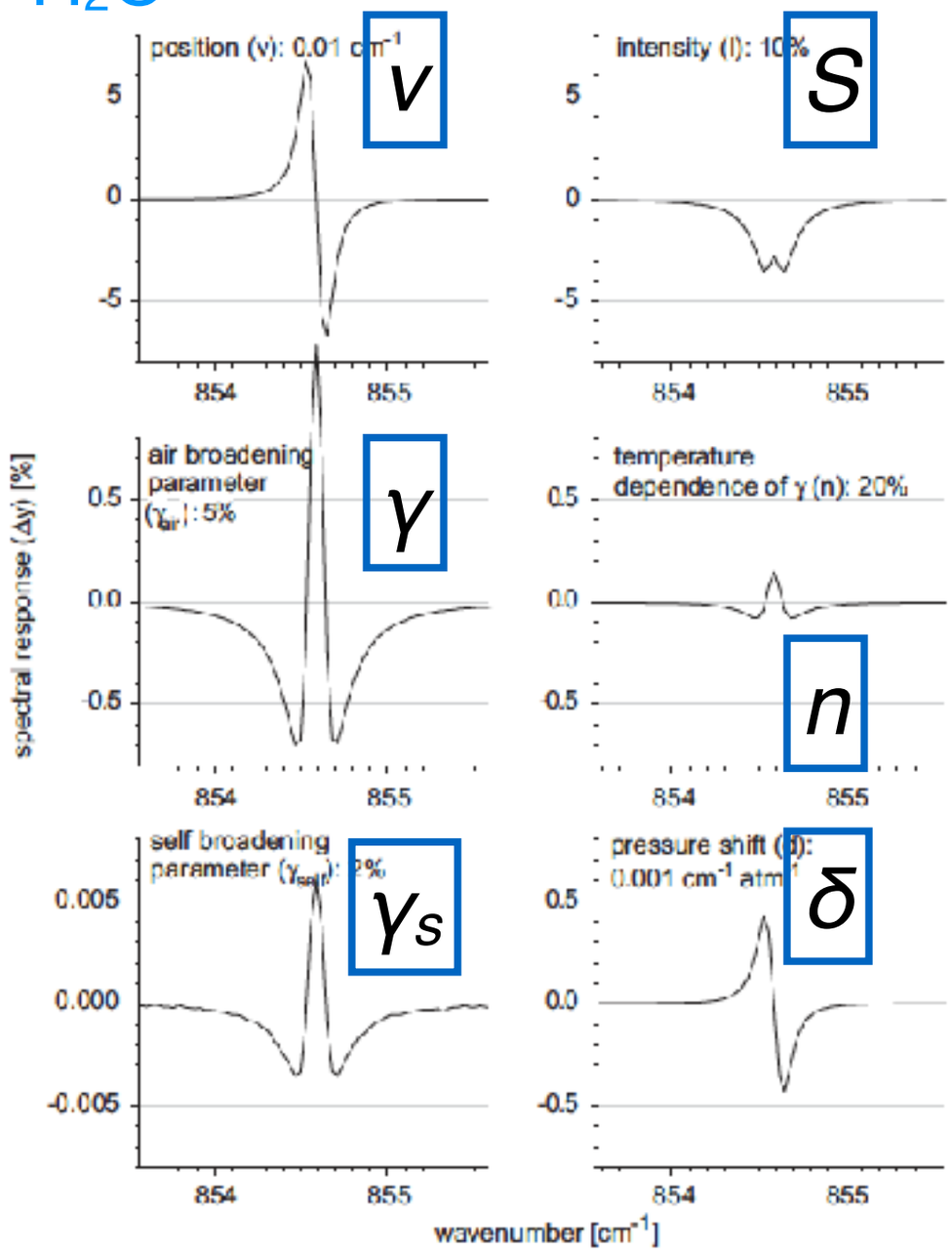
$$\alpha(x) = \frac{\Delta Col}{Col} \Big/ \frac{\Delta x}{x}$$

- O_3

Band	Weight w_l (%)	$\alpha(x)$ or $\alpha_l(x)$		
		$x = S$	$x = \gamma_{air}$	$x = n_{air}$
001 ← 000	91.2	−0.94	−0.152	−0.049
011 ← 010	5.0	−1.75	0.541	0.063
100 ← 000	1.7	−0.86	0.245	0.021
002 ← 001	1.5	−1.51	0.286	0.067
Weighted sum	99.4	−0.98	−0.104	−0.035

Janssen et al, *J. Mol. Spectrosc.* **326** (2016)

- H_2O



Schneider & Hase, *J. Quant. Spectrosc. Radiat. Trans.* **110** (2009)

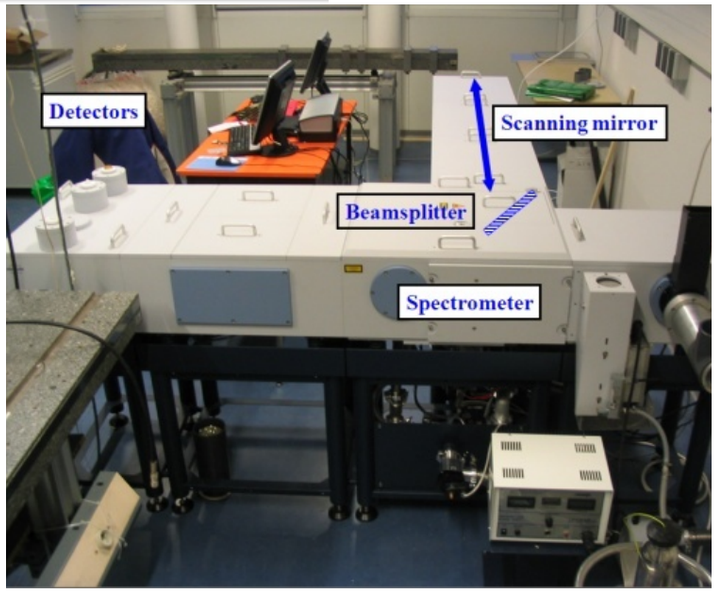
FTS-Paris at Air Quality Station Jussieu: Remote Sensing over a Megacity

- pollutant monitoring
- GHG monitoring
  - TCCON (provisional) status since June 2015
  - high-resolution
  - GHG: CO_2, CH_4, N_2O, HF, CO, H_2O, HDO
  - required precision (CO_2)

    right now: 1 ppm → 0.25 %

    future: 0.5 ppm → 0.125 %

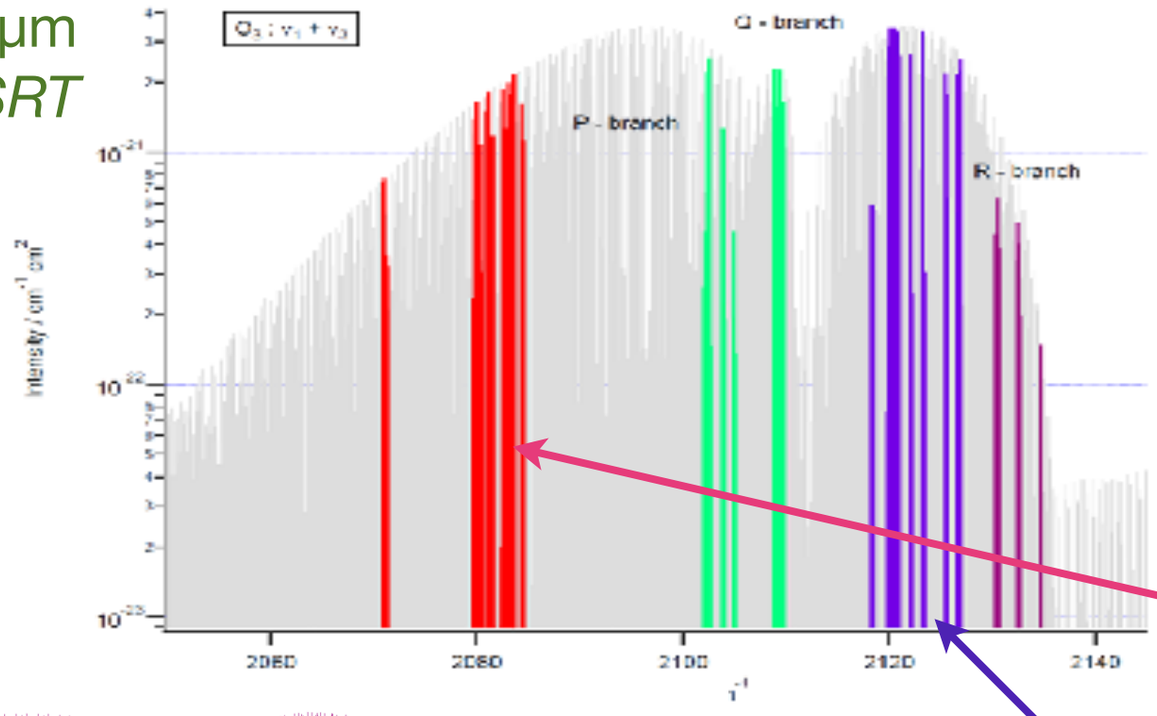
Bruker 125 HR



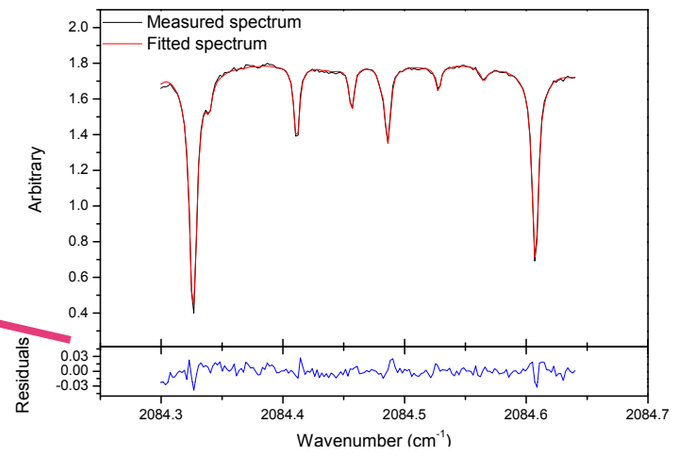
O_3 Multispectral Study 5 & 10 µm

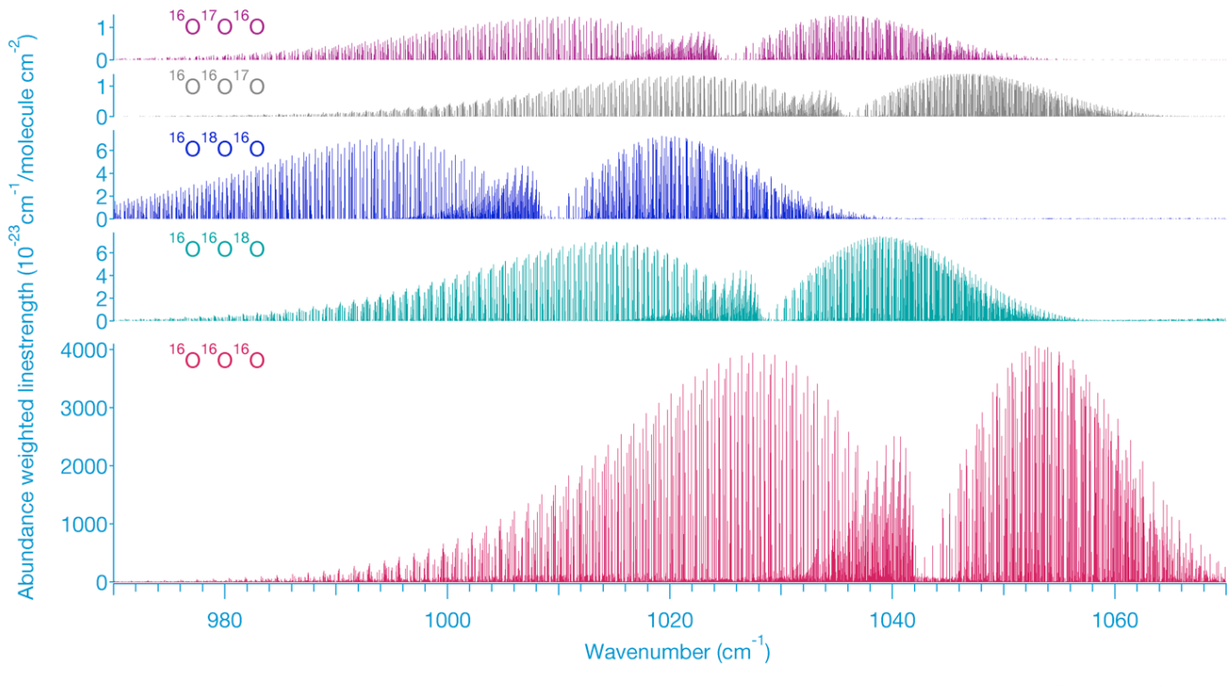
FTS-Paris

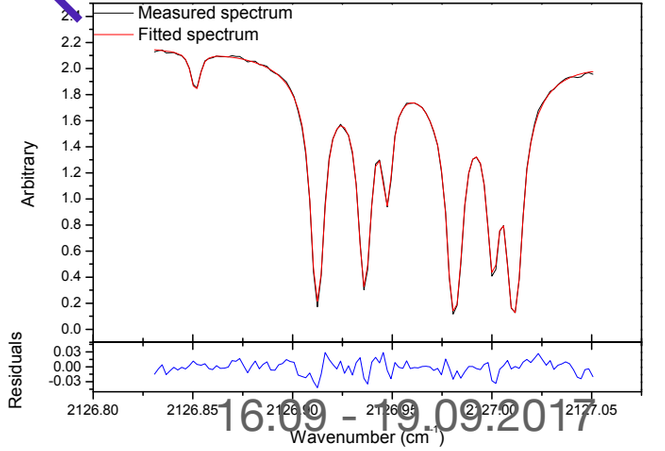
Good agreement (< 2%) between 5 and 10 µm (Thomas et al. *JQSRT* **111**, 2010)



Problem with evaluation of (ACE) satellite data (Walker et al. 2007)





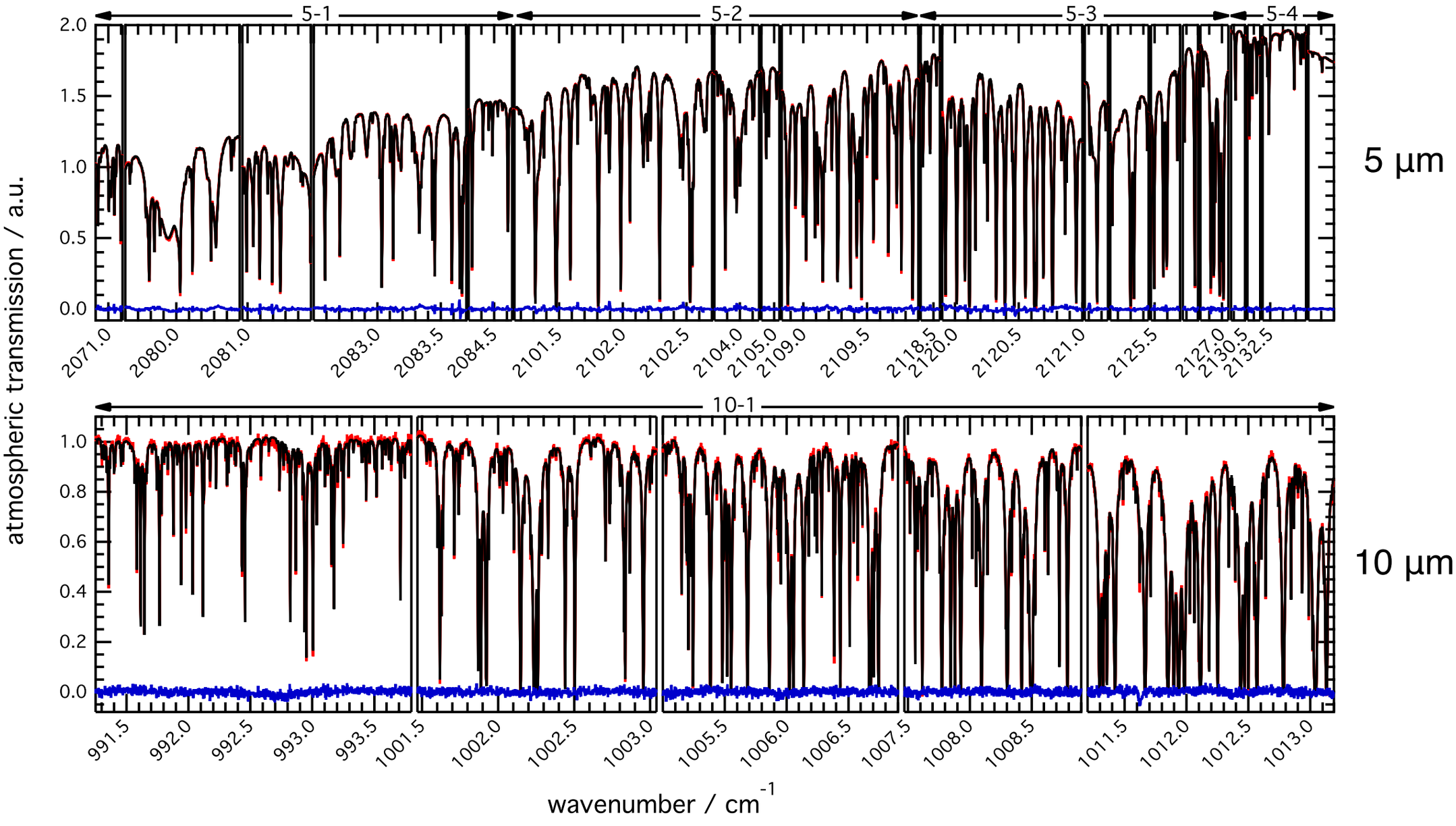


Vitacura

ESO Calibration

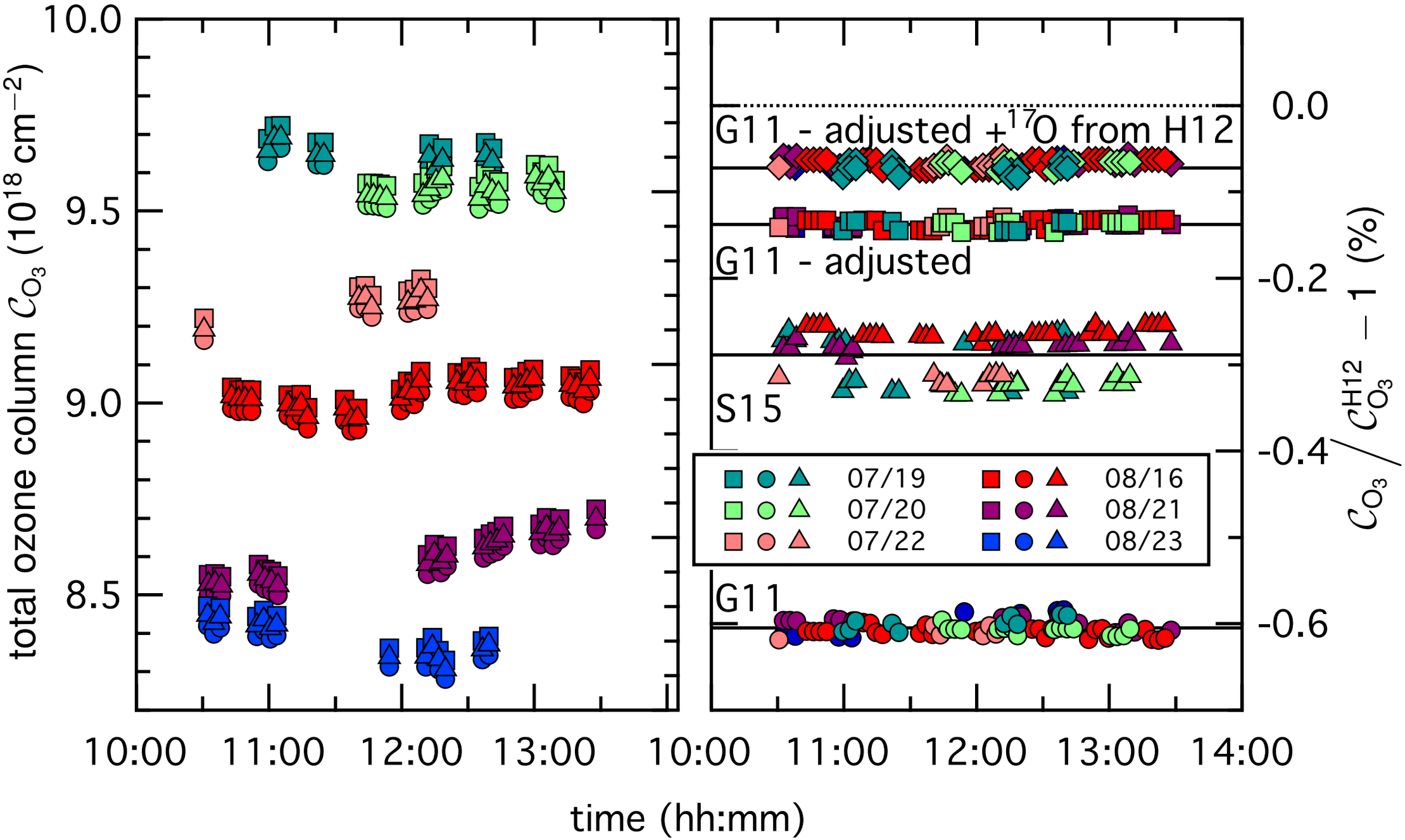
16.09 - 19.09.2017

Atmospheric FT spectra over Paris



O_3 Multispectral Study - 10 µm

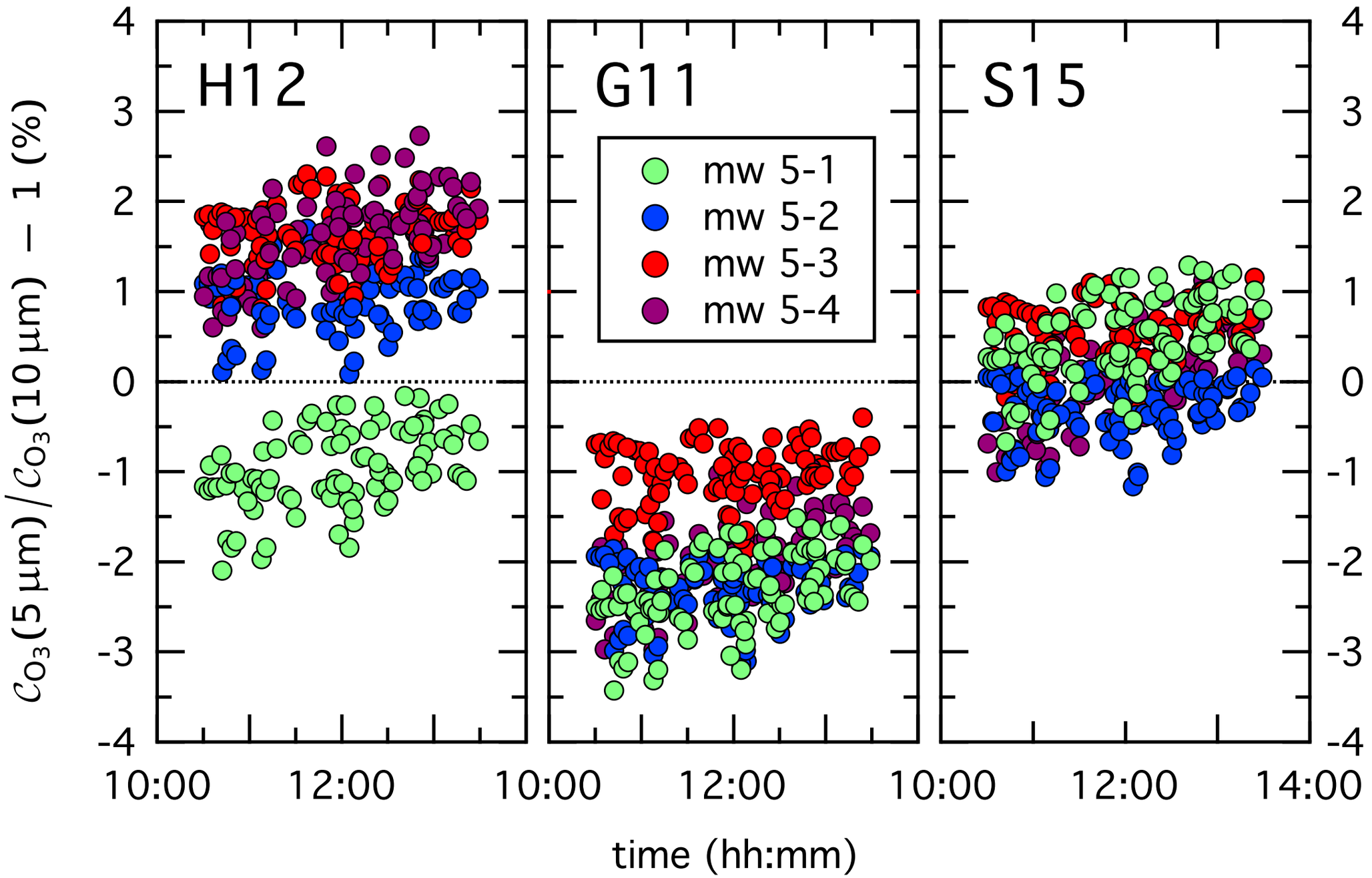
FTS-Paris



Janssen et al, *J. Mol. Spectrosc.* **326,** 48 (2016)

O_3 Multispectral Study 5 & 10 µm

FTS-Paris



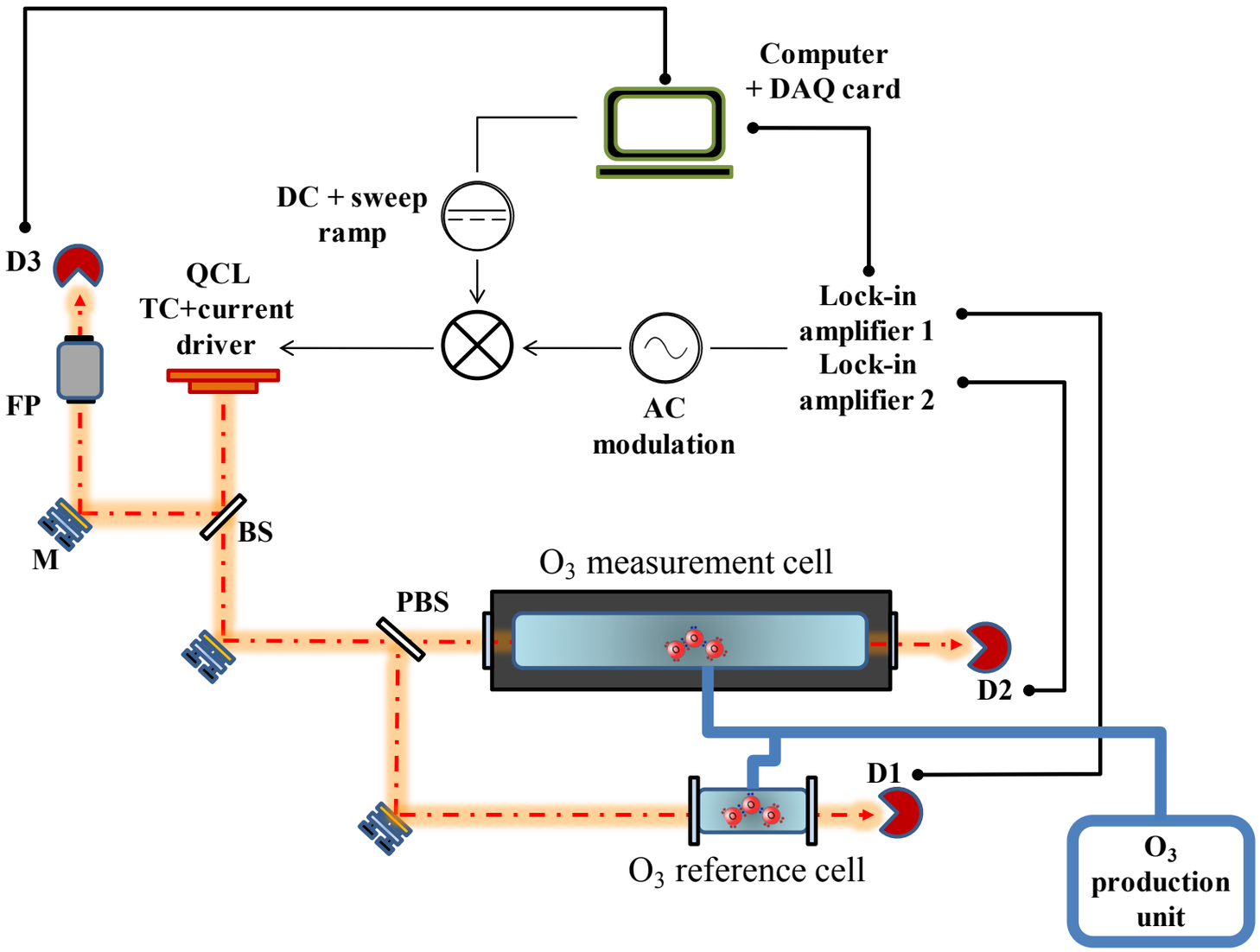
Janssen et al, *J. Mol. Spectrosc.* **326,** 48 (2016)

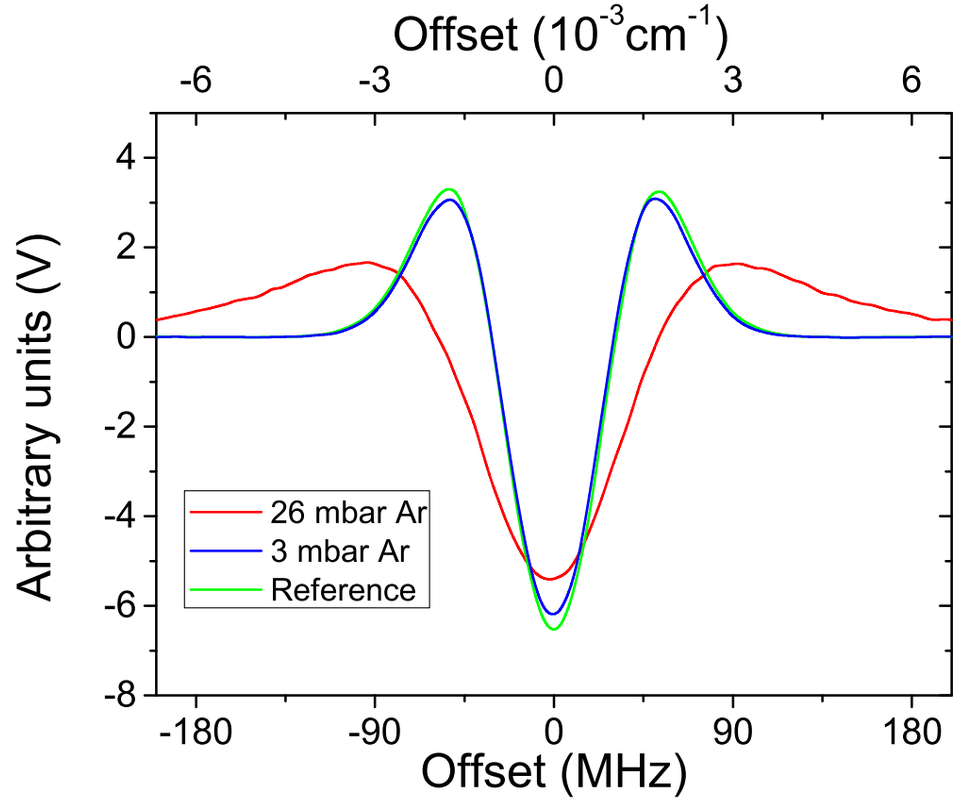
Short Summary

- At 10 µm data bases (DBs) are consistent (< 1 %)
- At 5 µm differences between DBs are larger (> 1 %)
- SM&PO data base is currently most consistent (< 1 %)
- obvious need to include isotopes in order to get to the < 1% accuracy level

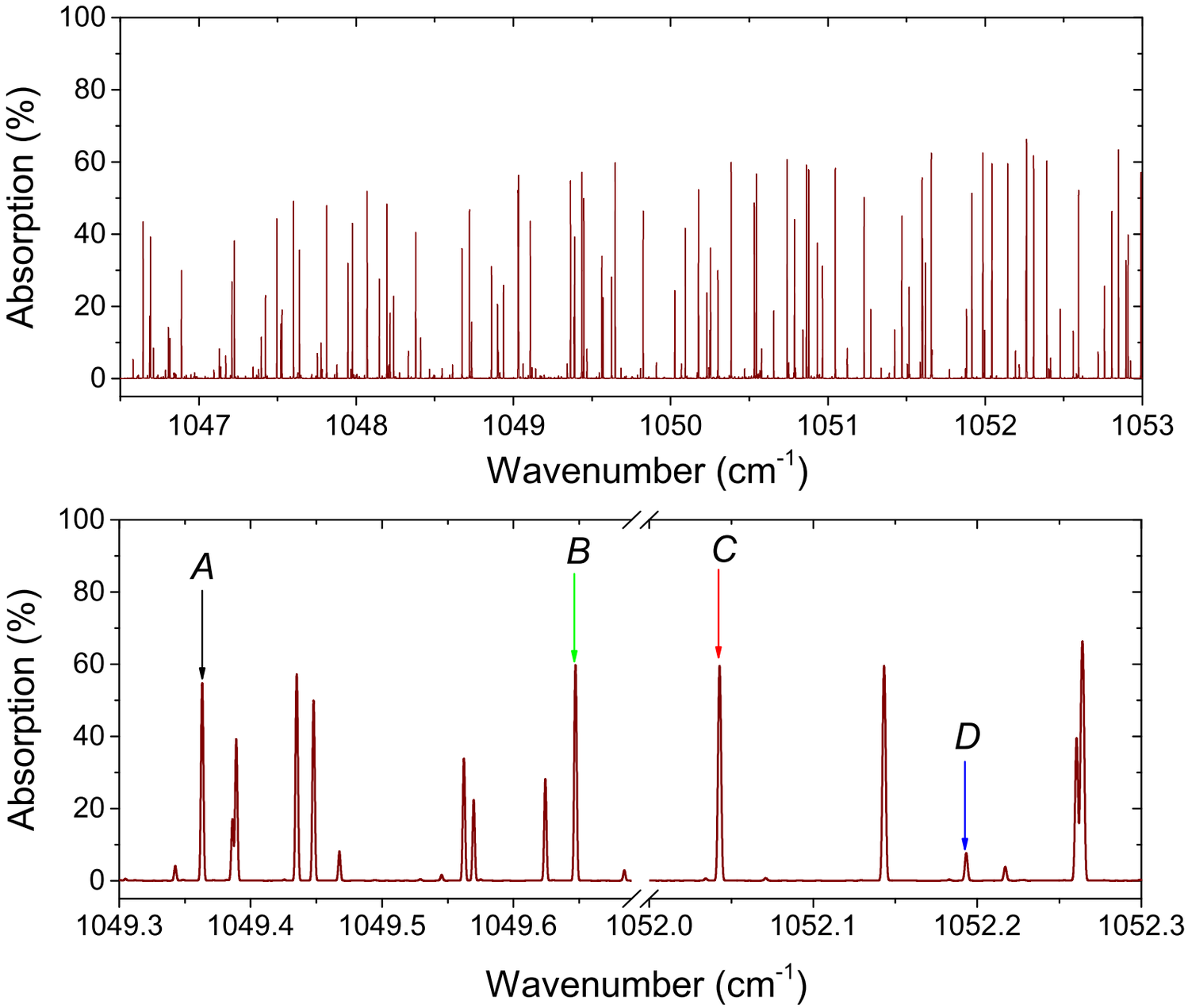
Pressure shift at 10 µm

Pressure shift

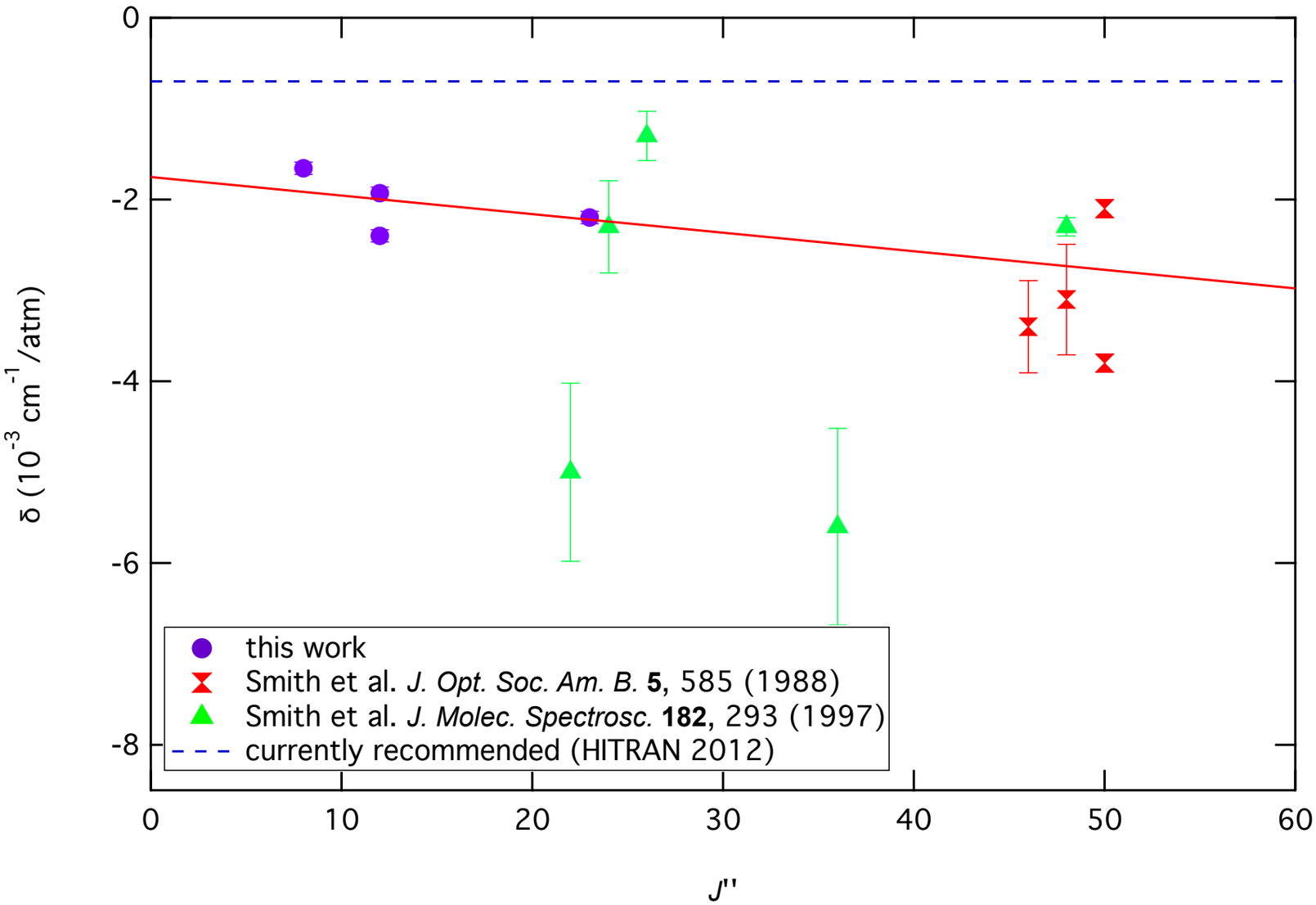




Pressure shift

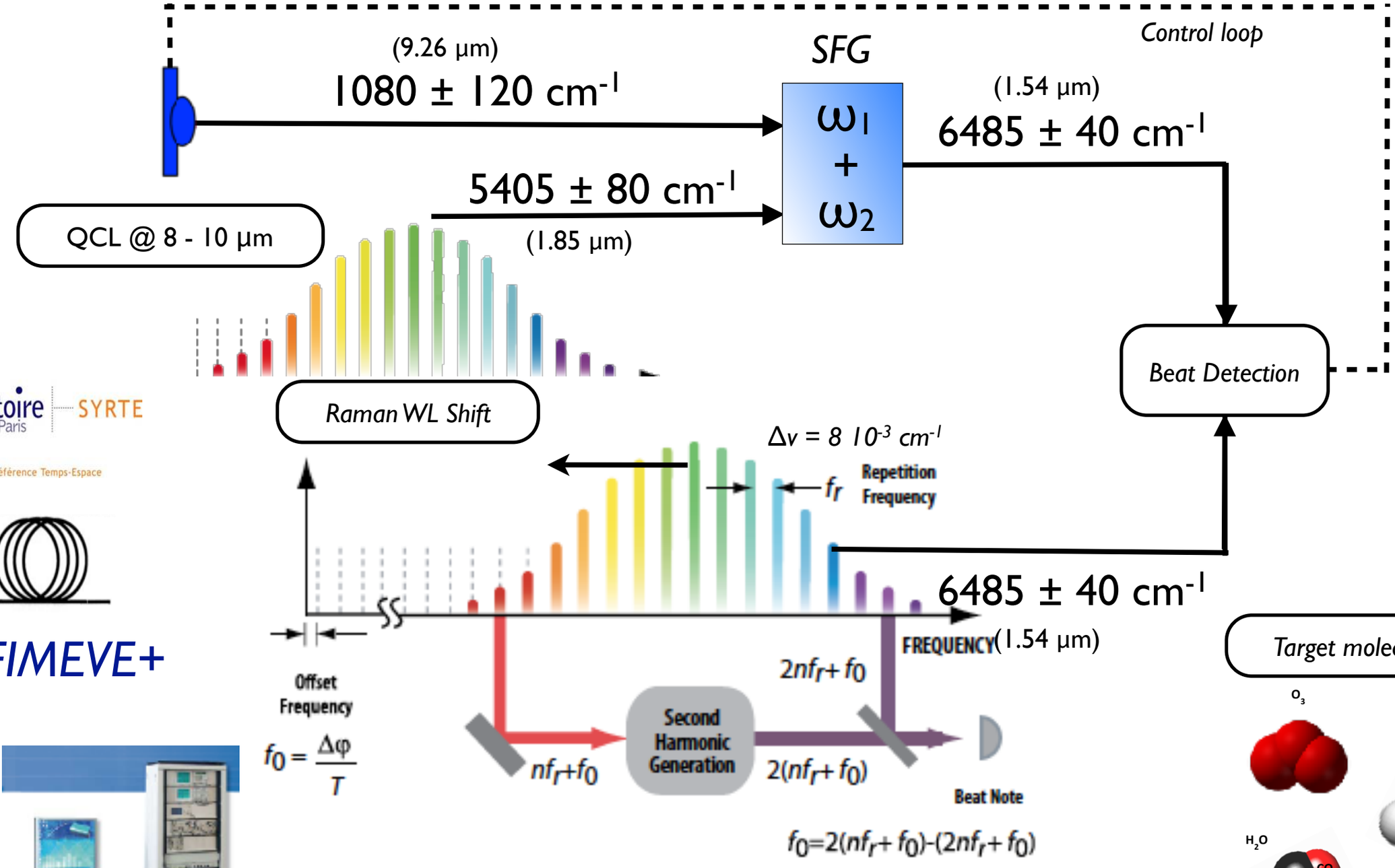


Pressure (air) shift



Minnissale et al, in prep. for publication in *J. Mol. Spectrosc.*

Ongoing project



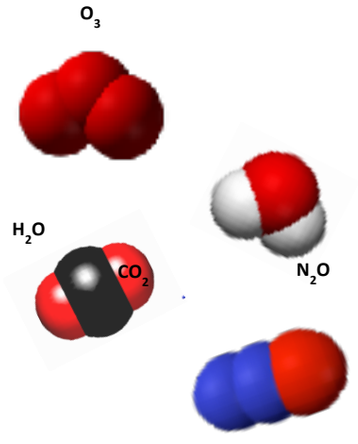
l'Observatoire de Paris — SYRTE
Systèmes de Référence Temps-Espace

REFIMEVE+

Menlo FC1500-250-WG

A. Amy-Klein et al. *Opt. Lett.* ***30****, 3320 (2005)*

Target molecules



Thanks to

- colleagues

  C. Boursier
  H. Elandaloussi
  P. Jeseck
  D. Koshelev
  C. Rouillé
  Y. Té
  T. Zanon

- former colleagues

  C. Camy-Peyret
  B. Daudé
  M. Guinet
  M. Minissale
  D. Mondelain
  D. Simone

- collaborators

  A. Amy-Klein (LPL/F)
  F. Néz (LKB/F)
  H. Fleurbaey (LKB/F)
  J. Gröbner (PMOD-WDC/CH)

- funding agencies

Virtual Atomic and Molecular Data Centre
(VAMDC: *http://www.vamdc.eu*)

Latest Achievements and Prospects for Collaboration

M.L. Dubernet[1], C.M. Zwölf[1], N. Moreau[1], Y.A. Ba[1]

And VAMDC Consortium Collaboration

[1]LERMA Department, Paris Observatory
and Paris Observatory Data Center

History

The VAMDC Consortium is a technical and political framework for sharing Atomic and Molecular data

Build upon 2 FP7 European funded Projects:

- VAMDC: 2009-2012 with 25 different laboratories
  - The baseline of the Infrastructure
- SUP@VAMDC: 2012-2014 with 9 laboratories
  - Building the political framework
  - Expanding towards other communities
- Currently « VAMDC Consortium » is sustained
  - Via its members in kind (and cash via self-financing and fees for those not maintaining resources)
  - Via a small starting budget of 60kEuros for 4 years

Consortium Overview

*M.L. Dubernet & al, J. Opt. Phys. B, (**2016**), 49, 074003*

- The VAMDC consortium is:
  - Built on a Memorandum of Understanding.
  - Currently composed by 17 members who signed the MoU.
  - Officially launched on November 1, 2014.
- Board of Directors: Full members → Decisions
- Science and Technical Board: Full and Associated Members
  - Propose evolutions and Maintain the VAMDC infrastructure
- How to join us (accession documents)
  - Memorandum of Understanding
  - Internal Regulations
  - Roadmap

ABOUT US

Presentation

Partners +

Databases +

Virtual Tour

How to join us -
VAMDC Consortium
MoU
Internal regulations
Roadmap
Infrastructure

Supporting Projects

Policy Citation

HOW TO JOIN THE VAMDC INFRASTRUCTURE

Step 1: If you want to share your atomic & molecular data through VAMDC infrastructure, please first contact the VAMDC team at support[at]vamdc.eu

Step 2: Once we agree on the terms, you might want to learn about the infrastructure

- Tutorials
- Standards

ABOUT US

Presentation

Partners +

Databases +

Virtual Tour

How to join us -
VAMDC Consortium
MoU
Internal regulations
Roadmap
Infrastructure

Supporting Projects

Policy Citation

HOW TO JOIN VAMDC CONSORTIUM AS A MEMBER

You might become a VAMDC Consortium Member under conditions set up in the Memorandum of Understanding, Articles 3.1 and 3.2. For further details and information, contact director[at]vamdc.eu

MoU's Articles 3.1 and 3.2 -

3.1 VAMDC Consortium Full Members

- The VAMDC Consortium Full Members are institutions that hold physically a resource tagged « VAMDC », i.e. a database or a service registered in the "VAMDC" registries, or that maintain/update a documentation officially tagged « VAMDC ».
- Otherwise full members can be institutions paying annual membership fees set by the Board of Directors.

Full Members can participate in calls engaging the VAMDC infrastructure and can use the "VAMDC brand". Accession to full member status is granted by the Board of Directors and an accession document is signed.

3.2 VAMDC Consortium Associated Members

Partners

17 full members today, Full Membres candidates

+ Associated Members candidates

EURO

Astronomska Opservatorija (Serbia, M. Dimitrijevic)
Observatory of Cagliari - INAF (Italy, G. Mulas)
Observatory of Catania – INAF (Italy, G. Leto)
Observatory of Paris (France, M.L. Dubernet)
→ Legal Representative
Queen's University Belfast (UK, T. Millar)
Open University (UK, N. Mason)
University of Cambridge (UK, N. Walton)
University College London (UK, J. Tennyson)
Uppsala Universitet (Sweden, N. Piskunov)
Universitaet zu Koeln (Germany, S. Schlemmer)
Université de Bordeaux (France, V. Wakelam)
Université de Bourgogne (Dijon, V. Boudon)
Université de Champagne-Ardenne (Reims, V. Tyuterev)
Université Joseph Fourier (Grenoble, B. Schmitt)
Université Paul Sabatier (Toulouse, C. Joblin)
Université de Mons (Belgium, Quinet)
Atomic and Molecular Data Unit (IAEA, B. Braams)

Africa

University of South Africa (D. Smits)

RUSSIA

Institute for Astronomy RAS (T. Ryabchikova)
Institute of Atmospheric Optics (V. Perevalov)
Institute of Spectroscopy RAS (A. Ryabtsev) & RFNC (P. Loboda)

USA

NIST (Y. Ralchenko, C. Gonzalez)
The Harvard-Smithsonian Center for Astrophysics (L. Rothman)
Jet Propulsion Laboratory from NASA, CALTECH (B. Drouin)

South America

Universidade Federal do Paraná (Brazil, M. Fujimoto)
Corporacion Parque tecnologico de Merida (IVIC, C. Mendoza)

ASIA- PACIFIC

Tata Institute for Fundamental Research (India, E Krishnakumar)
Indian School of Mines (India, B. Antony)
Korea Atomic Energy Reserch Institute (South Korea, Y. Rhee)
Australian National University Flinders University (Australia, M. Brunger)
National Institute for Fusion Science (Japan, NIFS, I. Murakami)

About us

Log in

VAMDC consortium

Home | About Us | Services | News | Contact

You are here > About Us > Partners

ABOUT US

Presentation

Partners
France
UK
Germany
Sweden
Austria
Italy
Russia
USA
Australia
India
Korea
South Africa
Northern Ireland
Serbia
Venezuela

Databases

Virtual Tour

How to join us

Supporting Projects

INAF – Cagliari Astronomical Observatory
The National Institute for Astrophysics is the leading Italian Research Institute for the Study of the Universe
www.oa-cagliari.inaf.it
Read more

INAF-Catania Astrophysical Observatory
The Catania Astrophysical Observatory (OACT) is one of the twelve observatories which together with some former CNR Institutes
www.oact.inaf.it/
Read more

Logo **Universitaet Wien**
www.univie.ac.at/asap/main.php?s=databases
Read more

Logo **Corporacion Parque tecnologico de Merida**
Read more

Logo **Institute of Atmospheric Optics**
www.iao.ru/
Read more

Logo **Russian Federal Nuclear Center- All-Russian Institute of Technical Physics**
Read more

Institute of Spectroscopy RAS
Institute for Spectroscopy was established in 1968 as a successor of the Commission for Spectroscopy within the General physics and astronomy Branch of the USSR Academy of Sciences
isan.troitsk.ru/en/index.php?page=about
Read more

Astronomical Observatory Belgrade
Founded jointly with the Meteorological Observatory on April, 7 1887, Astronomical Observatory of Belgrade (AOB) is one of the oldest scientific institutions in Serbia
www.aob.rs/
Read more

ACCESS TO THE VIRTUAL TOUR

Mapping of the VAMDC partners and databases

Access to the virtual tour

MORE INFORMATION?

You have questions? You want to participate in our projects?

Contact us

Log in

VAMDC consortium

Home | About Us | Services | News | Contact

You are here > Virtual Tour > Where we are

VIRTUAL TOUR

Where we are

See our videos
Research
Education
Industry
Outreach

All countries | All fields | All activities

Databases
Partners

PARTNERS

1/ INAF – Cagliari Astronomical Observatory
The National Institute for Astrophysics is the leading Italian Research Institute for the Study of the Universe
www.ca-cagliari.inaf.it

Read more

2/ INAF-Catania Astrophysical Observatory
The Catania Astrophysical Observatory (OACT) is one of the twelve observatories which together with some former CNR Institutes
www.oact.inaf.it/

DATABASE

1/ PAH
The Theoretical Spectral Database of Polycyclic Aromatic Hydrocarbons was developed in collaboration by G. Malloci and G. Mulas

Read more

2/ ECaSDa – Ethylene Calculated Spectroscopic Database
Calculated data of ethylene (12C2H4). The data on ethylene contain the vibration-rotation energy levels, line positions
vamdc.univ-reims.fr/PHP/ethylene.php

Read more

ACCESS TO THE FORUM

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or

Access to the forum

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SEE OUR BLOGS

Links to blogs related to atomic and molecular data or astronomy

See our blogs

Databases	Type of A&M Data	Partners	Application's Fields
VALD	Atomic Linelists	Uppsalla, Vienna, Moscow – N. Piskunov	Stellar - GAIA
CHIANTI	Atomic Linelists and collisions	Cambridge (UK)+MSSL/UCL – H. Mason, G. Rixon	Solar Physics
Spectr-W3	Atomic Linelists and Collisions	Russia (RFNC VNIITF) – P. Loboda	Solar/Stellar Physics + Fusion
Stark-B	Atomic LineShifts/Broadening with charged perturbers	Observatory of Belgrade (Serbia) + Observatory of Paris (LERMA) – M. Dimitrijevic/S. Sahal-Bréchot	Stellar Physics + Plasmas
TipBase, TopBase	Atomic Linelists and Collisions from Opacity Project and IRON Project	Observatory of Paris (LERMA) + CTPM (Venezuela) + CDS (Strasbourg, Fce) – C. Zeippen/ C. Mendoza/F. Delahaye	Stellar Physics
CDMS	Molecular Linelists (mm, Sub-mm)	Cologne (Germany) – S. Schlemmer	ISM + Earth
JPL	Molecular Linelists (mm, Sub-mm)	Pasadena (USA) + Cologne (Germany) – B. Drouin	ISM + Earth
SMPO	O_3 linelists	Reims (France)+ Tomsk (Russia) – V. Tyuterev	Earth – Exo-Planets
MeCaSDa	Linelists CH_4	Dijon (France) – V. Boudon	Earth, Planets, Exo-Planets,

Databases	Type of A&M Data	Partners	Application's Fields
HITRAN	Molecular Linelists and Broadening Coefficients	Harvard (USA) + UCL – L. Rothman+J. Tennyson	Earth, Planets, Exo-Planets
CDSD	CO_2 Linelists	IAO, Tomsk – V. Perevalov	Earth, Planets, Brown Dwarfs
W@SIS	Water Information System	IAO, Tomsk – A. Fazliev+ UCL (J. Tennyson)	Earth and Planets
KIDA	Kinetic Data	Bordeaux (France) – V. Wakelam	ISM - Planetology
UdfA	Kinetic Data (ex-UMIST)	Belfast (UK) – T. Millar	ISM - Planetology
GhoSST	Solid Spectroscopy Data	Grenoble (France) – B. Schmitt	Planetology, ISM
LASP	Solid Spectroscopy Data	Obs. of Catania – G. Leto	Planetology, ISM
BASECOL	Low Energy Molecular Collisions	Observatory of Paris – M.L. Dubernet	ISM
PAH	PAH Theoretical Data and soon experimental Data	Observatory of Cagliari (Italy) – IRAP (Toulouse, France) – G. Mulas+C. Joblin	ISM and Planets

Databases	Type of A&M Data	Partners	Application's Fields
RADAM Ion interaction	Database for Radiation damage of molecules of biological interest induced by ion collisions: cross sections and fragmentation yields	GANIL - FRANCE	Biology – radiation Damage
IDEABD	Dissociative electron attachment upon interaction of low energy electrons with molecules.	Innsbrück	Radiation Damage, Planets, ExoPlanets,
BEAM-DB	Molecular/atom—electron collisions	Belgrade, Serbia	Biology, radiation damage
ECaSDa	Ethene Calculated LInelists	Reims – L. Daumont	Earth and Planets
ALADDIN2	Sub-Set of IAEA ALADDIN : atomic collisions	IAEA – Vienna – B. Braams	Plasmas
DESIRE	Spectroscopy of sixth row elements (Z=72-86)	Belgium – P.Quinet	Plasmas – Stellar - Solar
SESAME	Electronic Spectra of atoms and molecules	Paris Obs. – E. Roueff	ISM - Stellar

Databases	Type of A&M Data	Partners	Application's Fields
SHeCaSDa	Hexafluoride Calculated LInelists	Dijon – V. Boudon	Earth and Exo-Planets
TFMeCaSDa	Tetrafluoro-Methane calculated linelists	Dijon – V. Boudon	Earth
MOLD	Photo-Dissociation Cross-sections	Belgrade - Serbia	Stellar
LxCAT	Low temperature plasmas data	L Pitchford - Toulouse	Plasmas
NIST Atomic Specta	Spectroscopy of Atoms –	NIST – Yuri Ralchenko	Stellar – ISM - Plasmas
IAMDB	Indian Atomic and Molecular Database (atomic collisions, A+M spectroscopy)	Tata Institute Fundamental Research, ISM, Sandar Patel Univ	Astrophysics
DREAM	Radiative data for rare earth	Belgium – P Quinet	Stellar-Solar-Plasmas – Lighting -
ExoCross	Molecular Linelists	UK – UCL – J. Tennyson	Exo, Brown Dwarf, Earth, Stellar

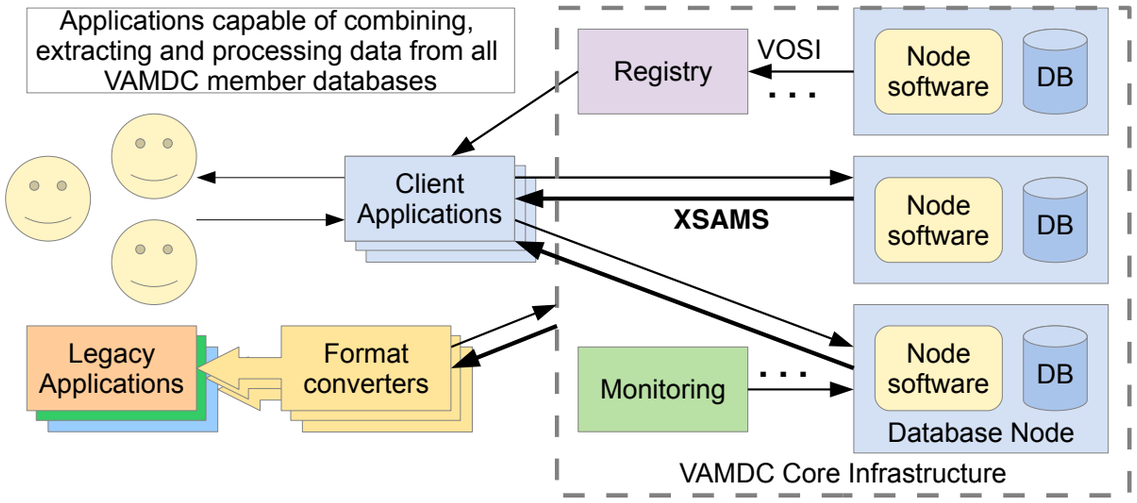
User Communities

- Atmospheric Science
  - input for complex terrestrial atmosphere/climate models, determination of concentrations and radiative transport of about 100 species
- Astrophysics, Astrochemistry and Planetary Science
  - great need for reliable A&M data because of extraordinary range of physical conditions
- Plasma Technologies
  - plasma-assisted materials processing or surface modification, e.g. manufacture of semi-conductor chips. A&M data needed for modeling chemically active plasmas.

User Communities cont'd

- Fusion Energy Research
  - design and operation of vital fusion device systems require large amounts of A&M collisional and spectroscopic data
- Radiation Science
  - radiotherapy models exploring damage of DNA by radiation need A&M data, e.g. electron collisions with DNA components and other biomolecules

How is VAMDC technically organised ?



- A set of standards (www.vamdc.eu/standards)
  - Data exchange Protocols, Data Description
  - Standard vocabulary for all exchanges, including for registration of ressources
- A set of software (www.vamdc.eu/software)
- Documentation and on-line support system (www.vamdc.eu)
- Monitoring of services

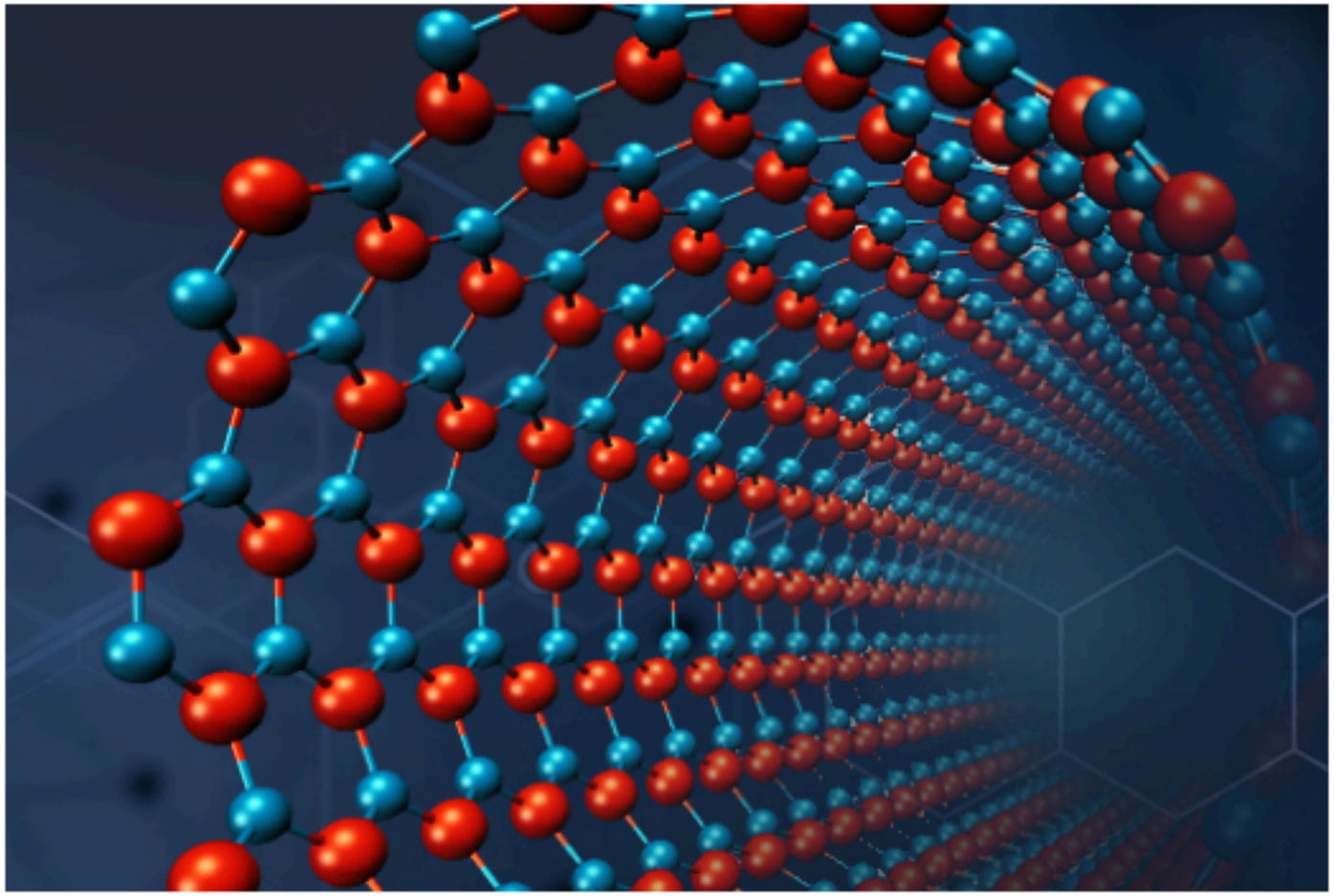
RESEARCH SERVICES

Access to Data
VAMDC Research Portal
RADAM Portal

Software
SPECTCOL
SPECVIEW
XSAMS Converter
PDL-VAMDC
JavaScriptPortal
TAPValidator
Java NodeSoftware
Python NodeSoftware
Libraries
Virtual machines for node building

Documents
Standards
Science use cases
Tutorials
See our videos
FAQ

SERVICES [RESEARCH]



VAMDC aims to be an interoperable e-infrastructure that provides the international research community with access to a broad range of atomic and molecular (A&M) data compiled within a set of A&M databases accessible through the provision of a single portal and of user software. Furthermore VAMDC aims to provide A&M data providers and compilers with a large dissemination platform for their work.

ACCESS TO THE DATA

Access to VAMDC databases

Access to the data

ACCESS TO THE FORUM

Exchange ideas, Ask questions, Find answers

Read more

or

Access to the forum

What can we currently do with VAMDC?

Virtual Atomic and Molecular Data Centre

- **Query all registered databases via the Portal (www.portal.eu) or orther portals**
  - **Visualisation of Data**
  - **Download of Data**

- Standalone Work with Software:
  - Query databases & Mix heterogeneous databases
  - → *Example of SPECTCOL software*

- Use of our libraries in user applications in order to access the VAMDC registered databases

- Include new databases or data in the infrastructure

Welcome to the VAMDC portal!

VAMDC aims to be an interoperable e-infrastructure that provides the international research community with access to a broad range of atomic and molecular (A&M) data compiled within a set of A&M databases accessible through the provision of this portal and of user software. Furthermore VAMDC aims to provide A&M data providers and compilers with a large dissemination platform for their work.

VAMDC infrastructure was established to provide a service to a wide international research community and has been developed in conjunction with consultations and advice from the A&M user community.

Currently we have 29 databases running and ready to serve you with the data.

Home VAMDC databases Guided query Advanced query Saved queries | Disclaimer Citation policy Info Feedback Login Register

Citation policy

You commit to cite the authors of the specific datasets you may use for realizing any published work, the databases publishing those datasets and the VAMDC Consortium.

- Citation of data should be done via normal reference from journals and Digital Object Identifier of datasets when such DOI will be implemented
- Citation of databases should be done via citing the name of the database, the URL of the database and the reference provided by the database to cite it
- Citation of VAMDC Consortium should be done via citing both its Name: « VAMDC Consortium » and the URL: « http://www.vamdc.org »

2 query forms

Tutorial for Portal

Home | VAMDC databases | Guided query | Advanced query | Saved queries | Disclaimer | Citation policy | Info | Feedback | Login | Register

Welcome to the VAMDC portal!

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Home | VAMDC databases | Guided query | Advanced query | Saved queries | Disclaimer | Citation policy | Info | Feedback | Login | Register

You must accept the following disclaimer to use our services (this will install a cookie in your web browser) :

Accept Decline

Submit

General Disclaimer

The VAMDC Consortium and its activities are based upon a high trust model within an academic environment. In case of an (alleged) infringement of any right of third parties, the Consortium should be contacted in writing in order to discuss the issue. In order to minimize the risks it should be clarified that the Consortium shall not provide any guarantee and/or warranty with respect to a fitness-for-purpose and furthermore that the Consortium shall not identify any party for any (alleged) infringement of any rights of third parties (including but not limited to intellectual and industrial property rights and/or rights of confidentiality).

Disclaimer for final users accessing the data and or running online services/processing (this disclaimer should be applied to all the web services provided by VAMDC in any form (TAP services, online code, etc))

Tutorials For Portal

RESEARCH SERVICES

Access to Data
VAMDC Research Portal
RADAM Portal

Software
SPECTCOL
SPECVIEW
XSAMS Converter
PDL-VAMDC
JavaScriptPortal
TAPValidator
Java NodeSoftware
Python NodeSoftware
Libraries
Virtual machines for node building

Documents
Standards
Science use cases
Tutorials
See our videos
FAQ

TUTORIALS

We provide different tutorial addressed both to data providers and final users.

Follow the links below for further information on each item of the following list:

- General page for Tutorials
- You produce/collect atomic and molecular data and want to include them into VAMDC
  - Outline
  - Self-Study Course
- How to use the VAMDC Portal
  - User Guide for the Portal
  - First Steps with the VAMDC Portal
  - Extracting Data from query results with the viewers
- How to use VAMDC software
  - Spectcol – Readmore
  - Specview – Readmore
  - PDL-VAMDC – Readmore
  - The XSAMS file format and TAP Validator application (mainly for the data providers)
  - Python Scripting
  - Using VAMDC Java libraries
  - You want to check XSAMS files, TAPValidator – ReadMore

ACCESS TO THE DATA

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Access to the portal

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VAMDC Queries

- SQL-like requests
- Example : select * where ((AtomSymbol = 'he') OR (AtomSymbol = 'li'))
  - All quantities are well defined into a dictionary
  - http://dictionary.vamdc.eu

VAMDC Queries

Molecules, their states and quantum numbers

Show/Hide

Keyword	Short Description	Long Description	Type	*
MoleculeBasisStates	The basis states for a set of molecular states expressed as a linear combination on some basis	The basis states for a set of molecular states expressed as a linear combination on some basis		
MoleculeCASRegistryNumber	CAS registry number of molecule	CAS registry number of molecule	String	
MoleculeCNPIGroup	CNPI group of molecule	CNPI group of molecule	String	
MoleculeChemicalName	Molecule name	Conventional molecule name, e.g. CO2, NH3, Feh (may not be unique)	String	
MoleculeComment	Comment on molecule	Comment on molecule	String	
MoleculeIUPACName	IUPAC name of molecule	IUPAC name of molecule	String	
MoleculeInchi	Inchi of molecule	Inchi of molecule	String	
MoleculeInchiKey	InchiKey if molecule	InchiKey if molecule	String	
MoleculeIonCharge	Molecule ion charge	Molecule ion charge	Integer	
MoleculeMolecularWeight	molecular weight	molecular weight	Float	*
MoleculeNormalModeDisplacementVectorComment	Comments concerning this normal mode's displacement vectors	Comments concerning this normal mode's displacement vectors	String	
MoleculeNormalModeDisplacementVectorMethod	Method for displacement vector in molecule normal mode	Method for displacement vector in molecule normal mode	String	
MoleculeNormalModeDisplacementVectorRef	A reference to the atom in the molecule's structure to which this displacement vector applies	A reference to the atom in the molecule's structure to which this displacement vector applies	String	

VAMDC consortium

Home | VAMDC databases | Guided query | Advanced query | Saved queries | Disclaimer | Citation policy | Info | Feedback | Login

Query by...

- Species
- Processes
- Environment
- Advanced

Atom 1 Clear «

Atom symbol	He	
Mass number		to
Nuclear charge		to
Ion charge		to
InChIKey		
State energy		to
	1/cm	
Equivalent to	1/cm	

Molecule 1 Clear «

Chemical name	
Stoichiometric formula	CO
Structural formula	
Spin isomer	
Standard InChIKey	

- CO
- COS
- CO2
- CO+
- COS+
- CO2+

Find data | Reset

Legend

available, can answer

available, don't support query

unsupported keyword

- Belgrade electron/atom(molecule) database (BEAMDB)
- TFMeCaSDa - CF4 Calculated Spectroscopic Database
- Photodissociation - MolD database
- Chianti
- GSMA Reims S&MPO
- ECaSDa - Ethene Calculated Spectroscopic Database
- GhoSST
- SHeCaSDa - SF6 Calculated Spectroscopic Database
- Stark-b
- JPL database: VAMDC-TAP service
- HITRANonline
- RADAM - Ion Interactions
- MeCaSDa - Methane Calculated Spectroscopic Database
- VALD (atoms)
- VAMDC species-DB
- LXcat
- OACT - LASP Database
- TOPbase : VAMDC-TAP interface
- BASECOL: VAMDC-TAP interface
- UMIST Database for Astrochemistry
- IDEADB - Innsbruck Dissociative Electron Attachment Database
- TIPbase : VAMDC-TAP interface

Species database

- Repository of all species contained in the infrastructure, sorted by database
- http://species.vamdc.eu
- Browsable through a web site to find quickly where a species can be found,
- Data can be exported in a xls file, easy to sort or to convert to csv
- Queryable through an API :
  - http://species.vamdc.eu/api/v12.07/nodes
  - http://species.vamdc.eu/api/v12.07/species
- Returns JSON structured data

http://species.vamdc.eu

Home Nodes Species

Search

All nodes

Species name

helium

Stoichiometric formula

Mass min

Mass max

VALD sub-set in Moscow (obs)

Name	Stoichiometric formula	InChI	Mass number	InChIKey	Charge
Helium	He	InChI=1S/He/i1-1	3	SWQJXJOGLNCZEY-BJUDXGSMSA-N	0
Helium	He	InChI=1S/He/i1+0	4	SWQJXJOGLNCZEY-IGMARMGPSA-N	0

Search

All nodes

Species name

Carbon monoxide

Stoichiometric formula

Mass min

Mass max

Charge min

Charge max

BASECOL: VAMDC-TAP interface

Name	Stoichiometric formula	InChI	Mass number	InChIKey	Charge
CO	CO	InChI=1S/CO/c1-2	28	UGFAIRIUMAVXCW-UHFFFAOYSA-N	0

CDMS

Name	Stoichiometric formula	InChI	Mass number	InChIKey	Charge
Carbon Monoxide	CO	InChI=1S/CO/c1-2	28	UGFAIRIUMAVXCW-UHFFFAOYSA-N	0
Carbon Monoxide	CO	1S/CO/c1-2/i1+1	29	UGFAIRIUMAVXCW-OUBTZVSYSA-N	0
Carbon Monoxide	CO	1S/CO/c1-2/i2+1	29	UGFAIRIUMAVXCW-VQEHIDDOSA-N	0
Carbon	CO	1S/CO/c1-2/i2+	30	UGFAIRIUMAV XCW-	0

RESEARCH SERVICES

Access to Data
VAMDC Research Portal
RADAM Portal

Software
SPECTCOL
SPECVIEW
XSAMS Converter
PDL-VAMDC
JavaScriptPortal
TAPValidator
Java NodeSoftware
Python NodeSoftware
Libraries
Virtual machines for node building

Documents
Standards
Science use cases
Tutorials
See our videos
FAQ

STANDARDS

VAMDC standards are a set of norms, protocols, regulations which are the basis of the VAMDC-infrastructure operations.

Follow the links below for further information on each item of the following list:

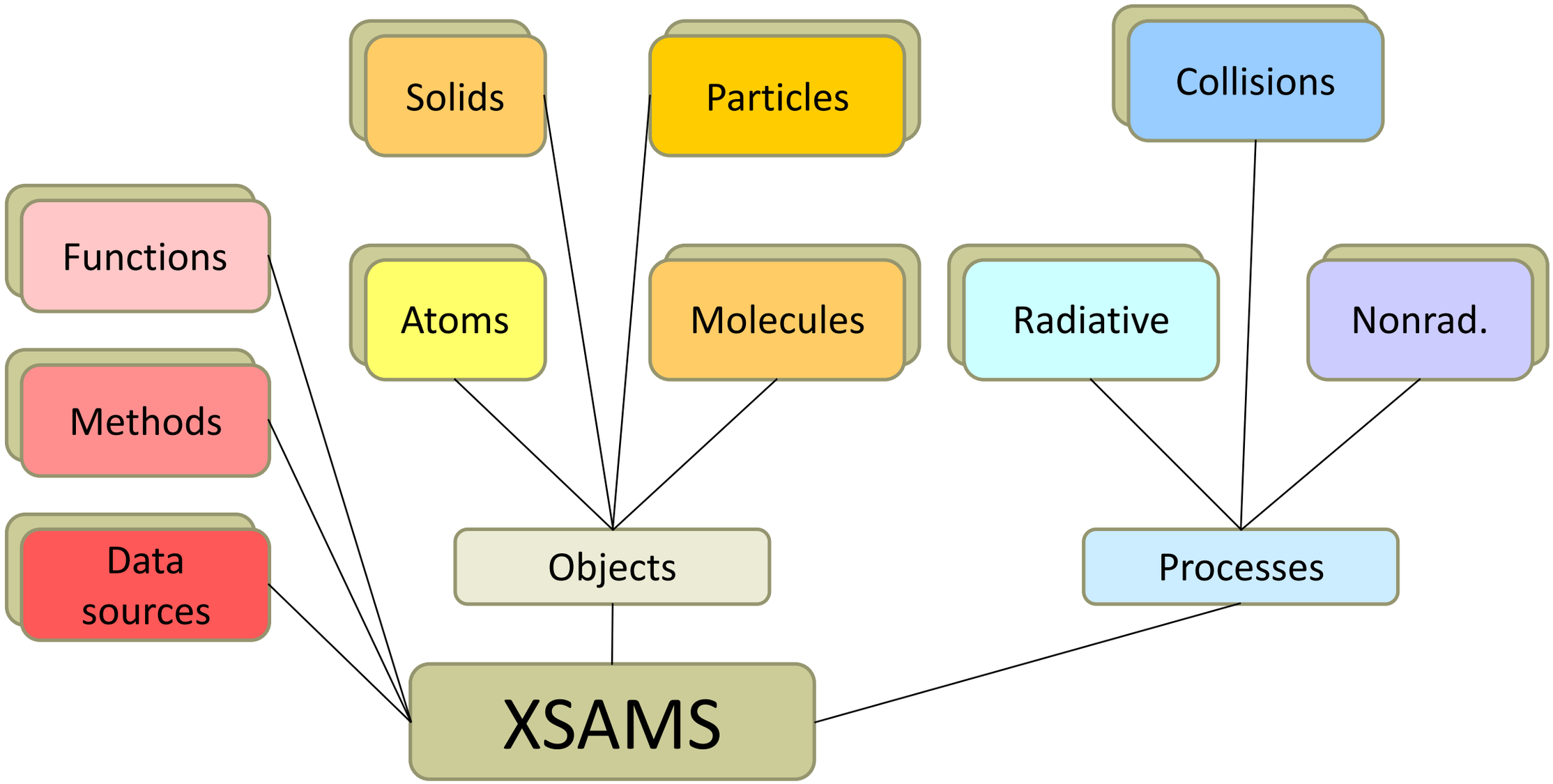
- VAMDC standards documentation page
  - VAMDC documentation and software versioning policy
  - Data access protocol, query language and dictionaries
  - Data model
  - Registry
  - Units
  - InChI Generation
  - XSAMS Processor service

Official citation of VAMDC standards

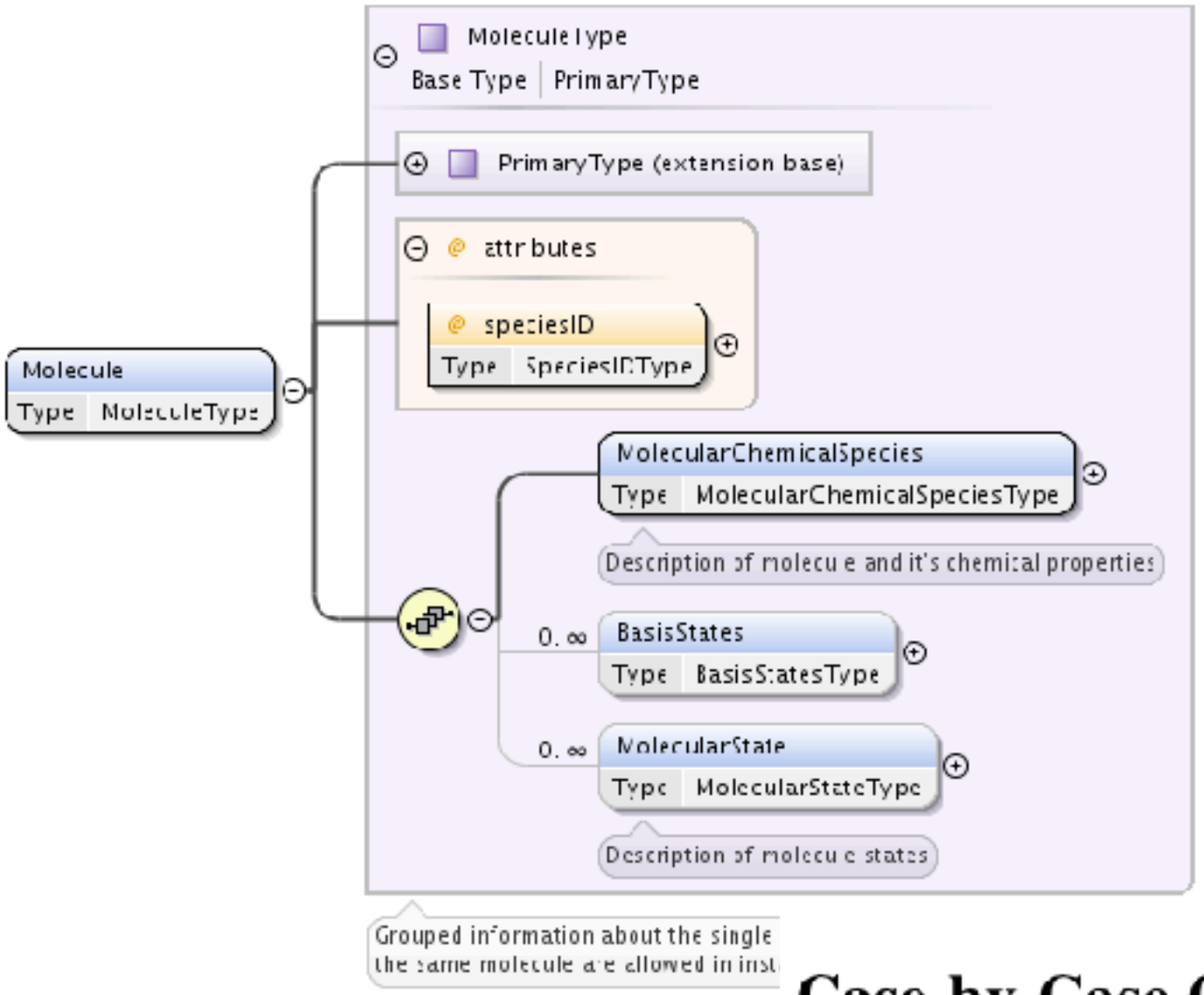
The official citation of VAMDC standards is:

« M. L. Dubernet, M. Doronin, C. Endres, C. Hill, T. Marquart, L. Nenadovic, Y. Ralchenko, G. Rixon and K. Smith, VAMDC Standards Documentation and Reference Guides, version r12.07, Virtual Atomic and Molecular Data Centre, http://standards.vamdc.eu (2012) »

XSAMS tree: XML Schema for Atoms, Molecules and Solids



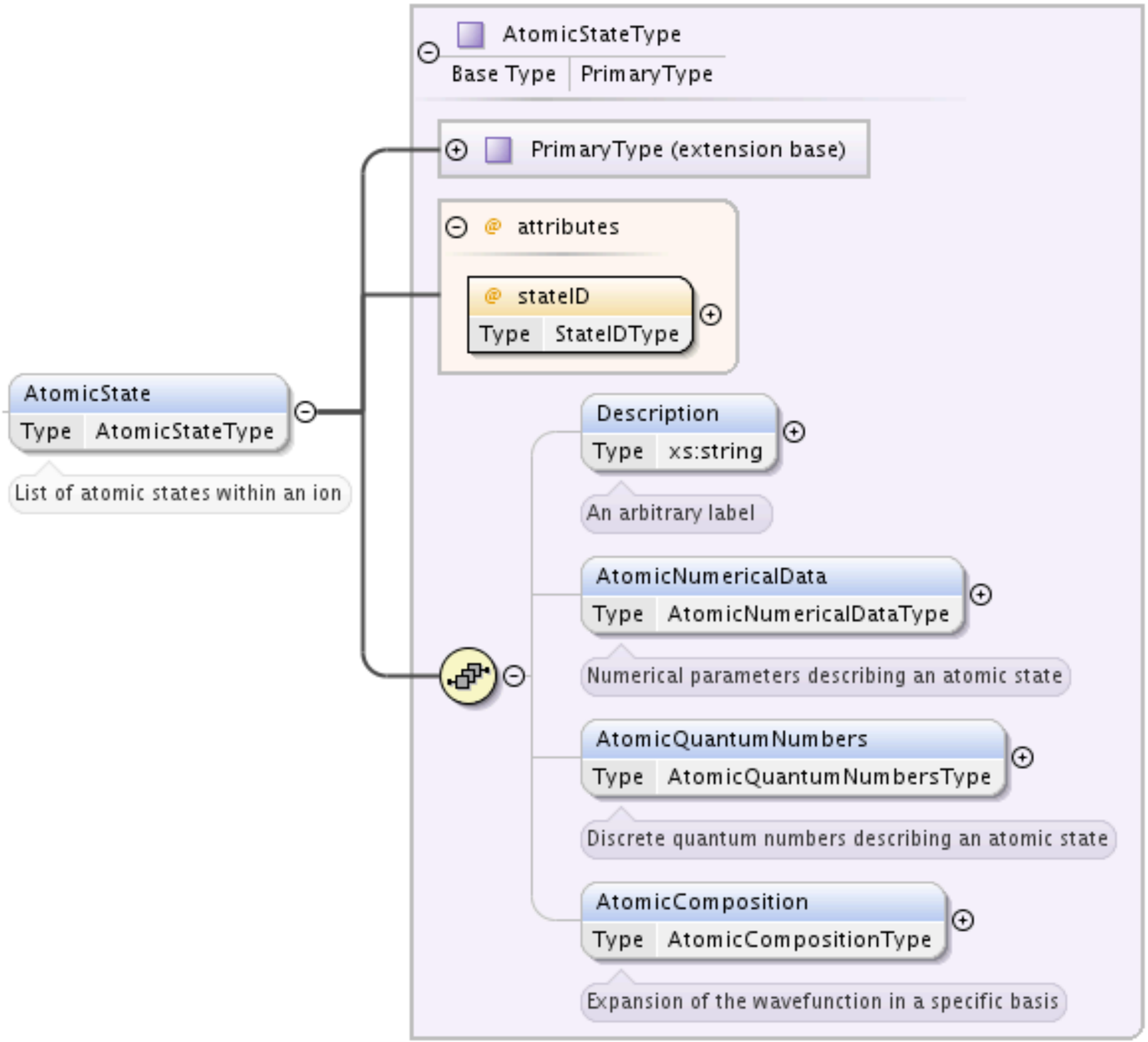
Molecule



Case-by-Case Quantum Number Descriptions

1. dcs: Diatomic closed-shell molecules
2. hunda: Hund's case (a) diatomics
3. hundb: Hund's case (b) diatomics
4. ltcs: Closed-shell, linear triatomic molecules
5. nltcs: Closed-shell, non-linear triatomics
6. stcs: Closed shell, symmetric-top molecules
7. lpcs: Closed-shell, linear polyatomic molecules
8. asymcs: Closed-shell, asymmetric top molecules
9. asymos: Open-shell, asymmetric top molecules
10. sphcs: Closed-shell, spherical-top molecules
11. sphos: Open-shell, spherical-top molecules
12. ltos: Open-shell,linear triatomic molecules
13. lpos: Open-shell, linear polyatomic molecules
14. nltos: Open-shell, non-linear triatomic

AtomicState



VISUALISATION OF DATA

Actions

Reset page | Show As Csv

Results from VAMDC node

1: Rotational de-excitation of CO (v=0) by He (Cecchi-Pestellini & al, 2002)

- Rate Coefficients
- Energy Table of CO
- Energy Table of He

2: Vibrational de-excitation of CO by He (Cecchi-Pestellini & al., 2002)

Rate Coefficients of Rotational de-excitation of CO (v=0) by He (Cecchi-Pestellini & al, 2002)

Unselect all	I1	I2	F1	F2	5.0	10.0	20.0	40.0	60.0	80.0	100.0	200.0	300.0
☑	2	1	1	1	3.4E-11	3.2E-11	3.0E-11	2.8E-11	2.7E-11	2.6E-11	2.6E-11	2.5E-11	2.5E-11
☑	3	1	1	1	1.3E-11	1.3E-11	1.2E-11	1.1E-11	1.1E-11	1.1E-11	1.1E-11	1.4E-11	1.6E-11
☑	3	1	2	1	4.2E-11	4.5E-11	4.5E-11	4.6E-11	4.7E-11	4.8E-11	4.9E-11	5.0E-11	5.2E-11
☑	4	1	1	1	6.2E-12	6.6E-12	7.2E-12	8.5E-12	9.5E-12	1.0E-11	1.1E-11	1.2E-11	1.3E-11
☑	4	1	2	1	2.3E-11	2.2E-11	2.0E-11	1.8E-11	1.8E-11	1.8E-11	1.9E-11	2.2E-11	2.6E-11
☑	4	1	3	1	4.6E-11	4.9E-11	5.0E-11	5.1E-11	5.2E-11	5.3E-11	5.4E-11	5.8E-11	6.1E-11
☑	5	1	1	1	1.8E-12	1.9E-12	1.9E-12	2.0E-12	2.1E-12	2.1E-12	2.2E-12	2.6E-12	3.1E-12
☑	5	1	2	1	1.3E-11	1.4E-11	1.5E-11	1.7E-11	1.8E-11	2.0E-11	2.1E-11	2.4E-11	2.7E-11
☑	5	1	3	1	2.7E-11	2.7E-11	2.4E-11	2.2E-11	2.2E-11	2.2E-11	2.3E-11	2.7E-11	3.1E-11
☑	5	1	4	1	5.3E-11	5.4E-11	5.4E-11	5.4E-11	5.4E-11	5.5E-11	5.6E-11	6.0E-11	6.4E-11
☑	6	1	1	1	1.4E-12	1.5E-12	1.8E-12	2.4E-12	2.9E-12	3.3E-12	3.7E-12	4.9E-12	5.8E-12
☑	6	1	2	1	3.4E-12	3.6E-12	3.7E-12	4.1E-12	4.4E-12	4.6E-12	4.9E-12	6.0E-12	7.0E-12
☑	6	1	3	1	1.7E-11	1.8E-11	1.9E-11	2.1E-11	2.3E-11	2.4E-11	2.6E-11	3.0E-11	3.3E-11

To be improved: exportation for example, **we need feedback from user**

VAMDC consortium

Home | VAMDC databases | Guided query | Advanced query | Saved queries | Disclaimer | Info | Feedback

Choose a request type (reset page)

- (•) For collisional process
- ( ) For radiative process
- ( ) By species

Define collision type

- (•) Without reaction (Elastic and Inelastic)
- ( ) With reaction

Process name

Process description

Process code

Please, enter the number of targets and colliders you wish to add

Targets

Atoms 0 Molecules 1 Particles 0

Colliders

Atoms 1 Molecules 0 Particles 0

Next ->

Submit query and find data

Save queries so that you can re-use them

1- in session

2 - later if you have worked being logged onto the portal

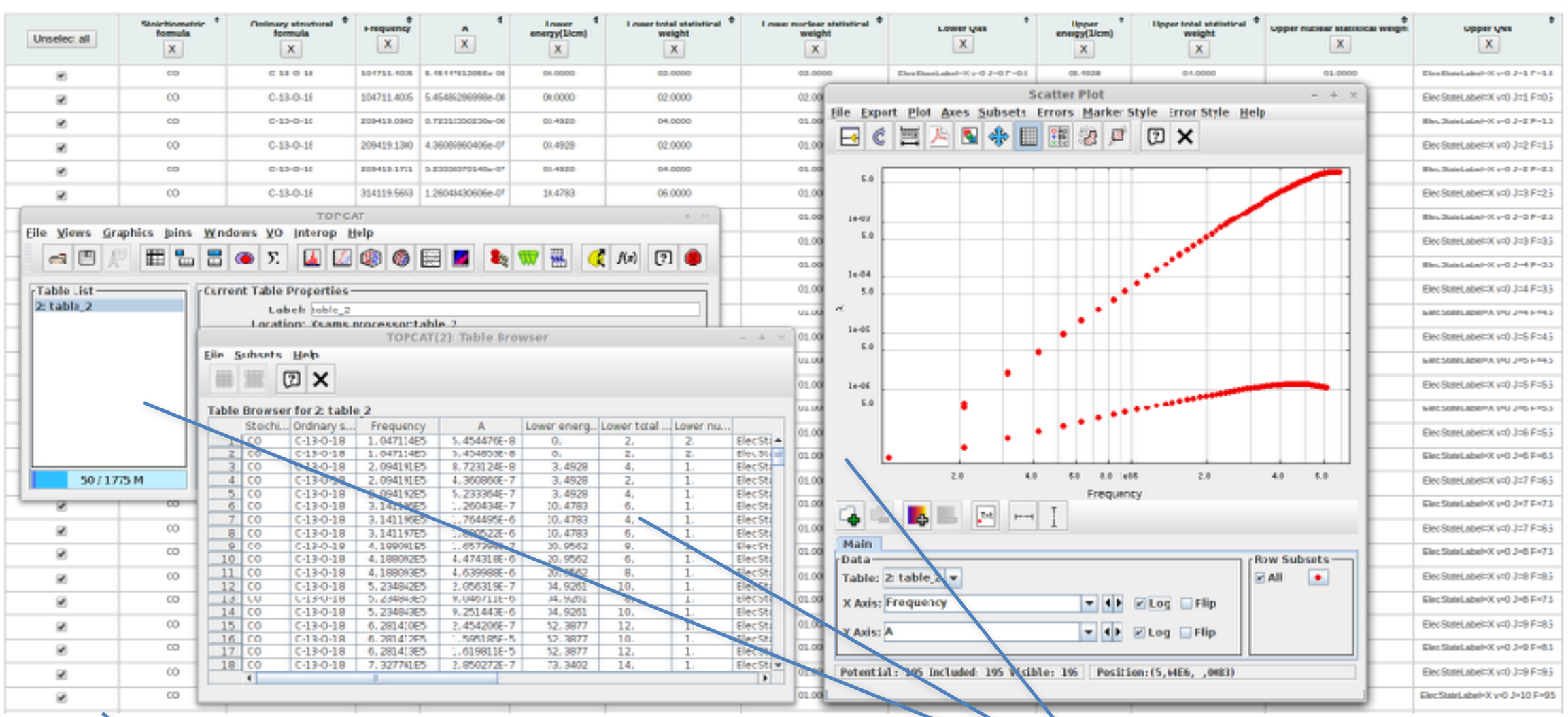
Home | VAMDC databases | Guided query | Advanced query | Saved queries | Disclaimer | Info | Feedback

No result selected

Query	Comments	Date	Database	Results	Results Status	Download
Edit / Clone / Delete: select * where ((target.InchiKey = 'UGFAIRIUMAVXCW-UHFFFAOYSA-N')) AND ((collider.AtomSymbol = 'He')) AND (CollisionCode = 'inel')		Jan 6, 2016	BASECOL: VAMDC-TAP interface	Sp: 6 -st:0 - Pr:2	OK	XSAMS
			KIDA: VAMDC-TAP interface	Sp: 3 -st:0 - Pr:0	OK	XSAMS

Data are sent to TOPCAT VO tool

Full compatibility with Virtual Observatory Tools



TOPCAT TOOL

OUR NEW VISUALISATION on PORTAL

What is the portal / What it is not

- Portal gives a visibility on the content of all the databases
- A single way to query all databases
- A single way to visualise the data
  - A single format description for quantities and quantum numbers
- Cannot perform the specific services that some databases might provide
  - Portal might be a first step towards finding the data

What can we currently do with VAMDC?

Virtual Atomic and Molecular Data Centre

- Query all registered databases via the Portal (www.portal.eu) or other portals
  - Visualisation of Data
  - Download of Data

- Standalone Work with Software:
  - Query databases & Mix heterogeneous databases
  - → *Example of SPECTCOL software*

- Use of our libraries in user applications in order to access the VAMDC registered databases

- Include new databases or data in the infrastructure

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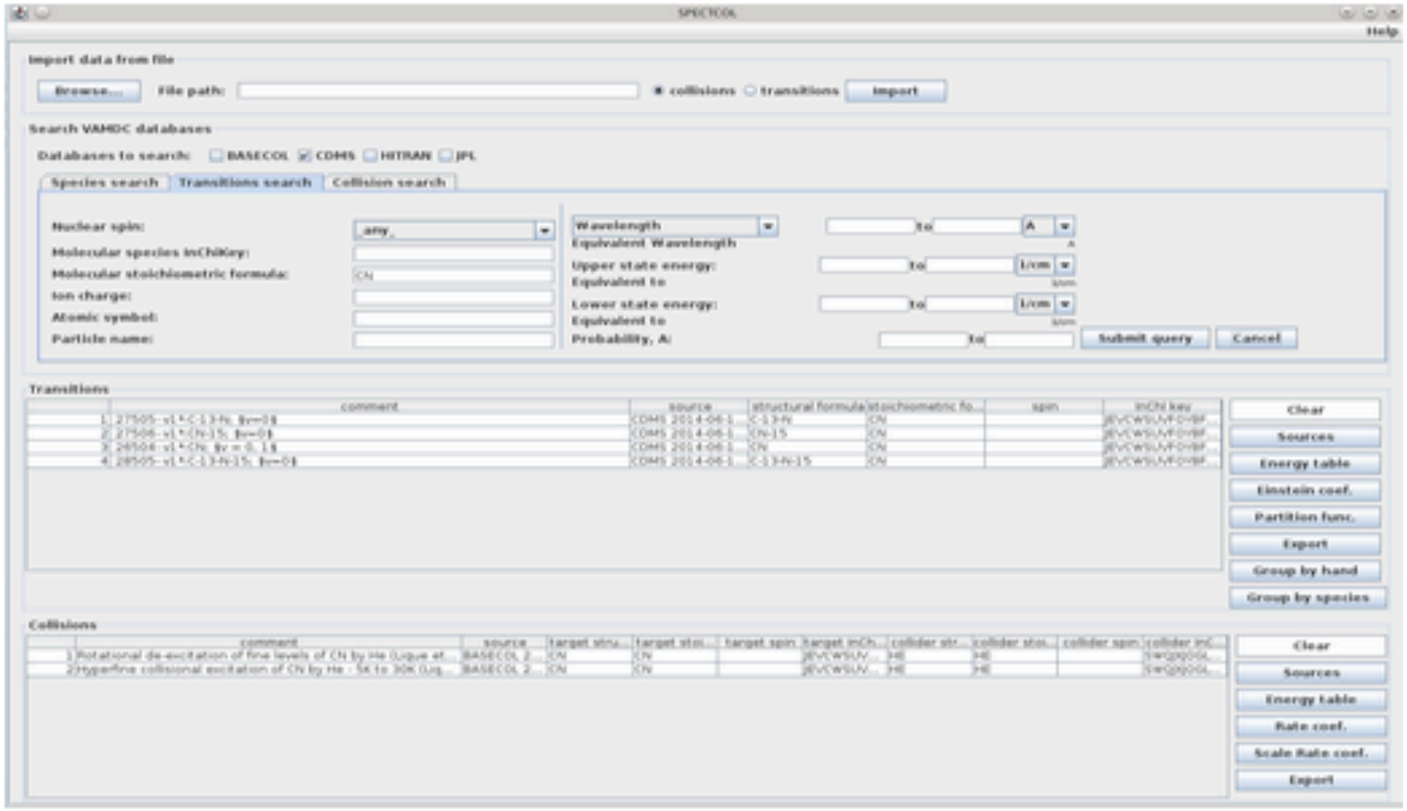
SPECTCOL



SPECTCOL is a graphical tool implemented in Java. It allows to manipulate and combine spectroscopic and collisional data coming from the databases (BASECOL, CDMS, HITRAN, JPL,…) using VAMDC technology.

XSAMS(Xml Schema for Atoms, Molecules and Solids) is the VAMDC data format and SPECTCOL is able to manipulate and provides methods to convert these data into other formats(CSV, RADEX, LTE …).

For any question or feedback use the forum link here.

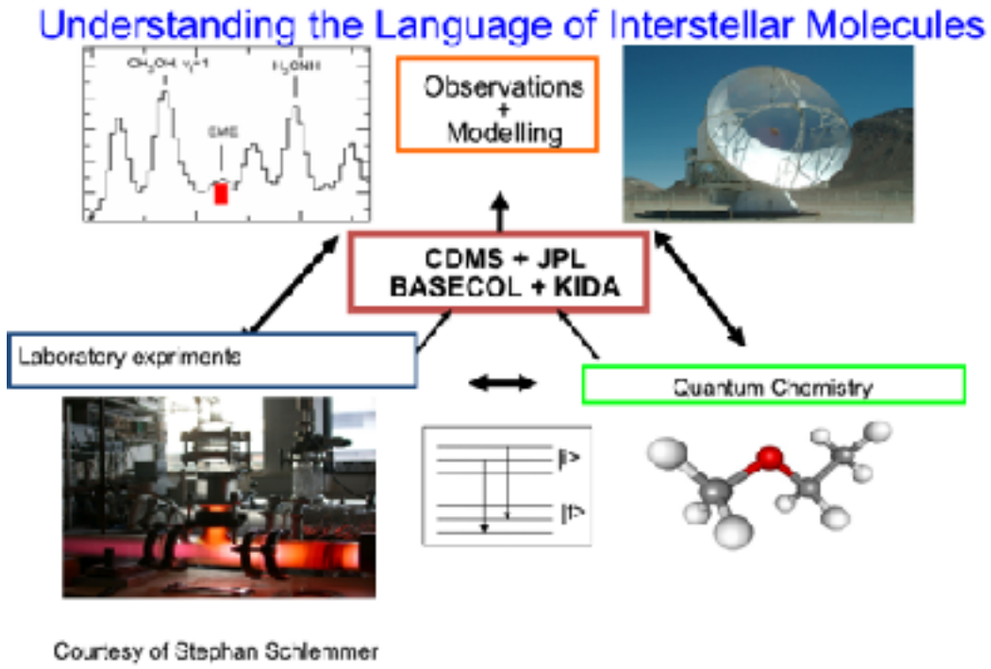
Credits:

M.L. Dubernet, Y.A. Ba, L. Nenadovic, M. Doronin

Scientific Use Case

Provide GUI to users to solve specific user problems

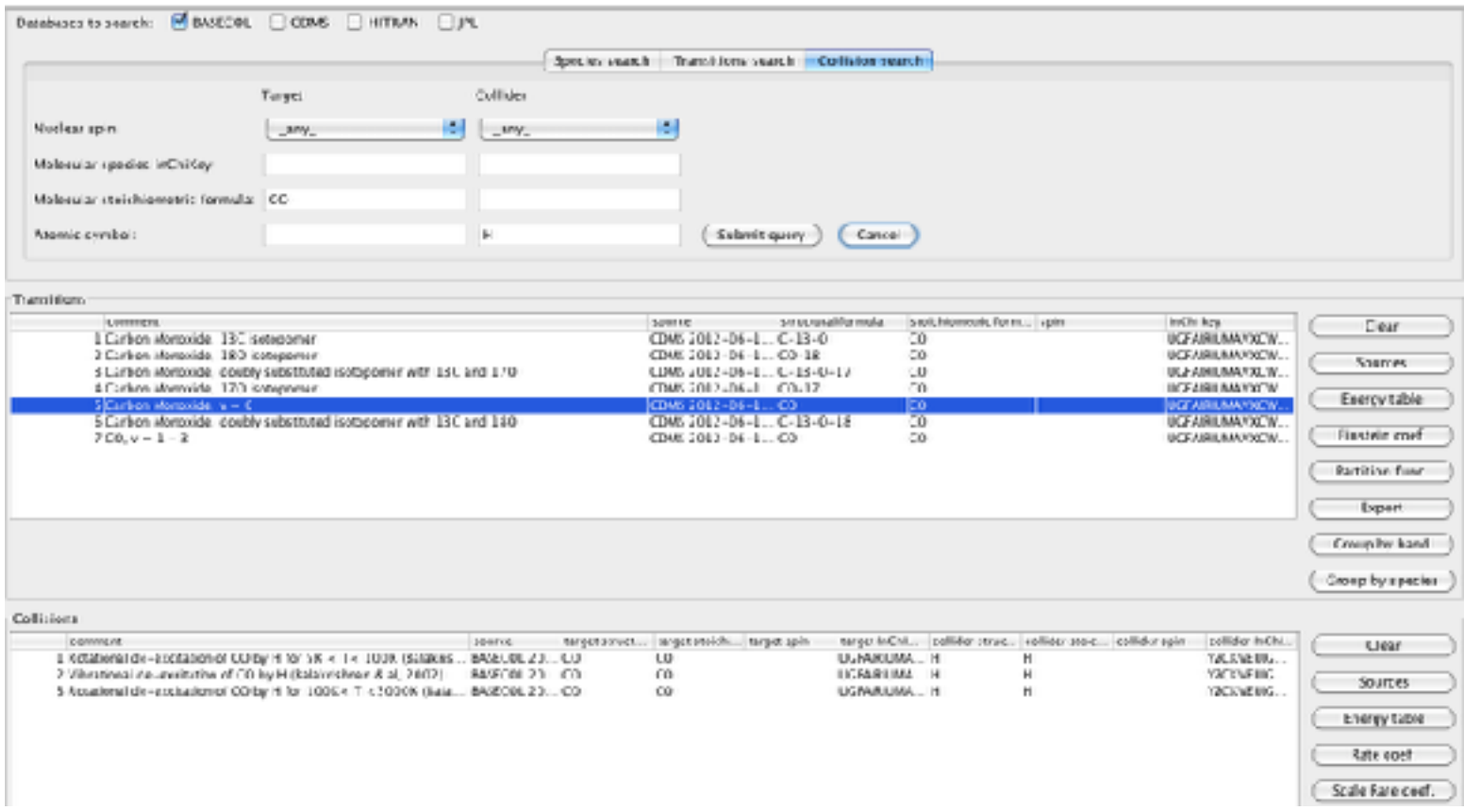
SPECTCOL Tool: Y.A. Ba (Obs Paris, LERMA)



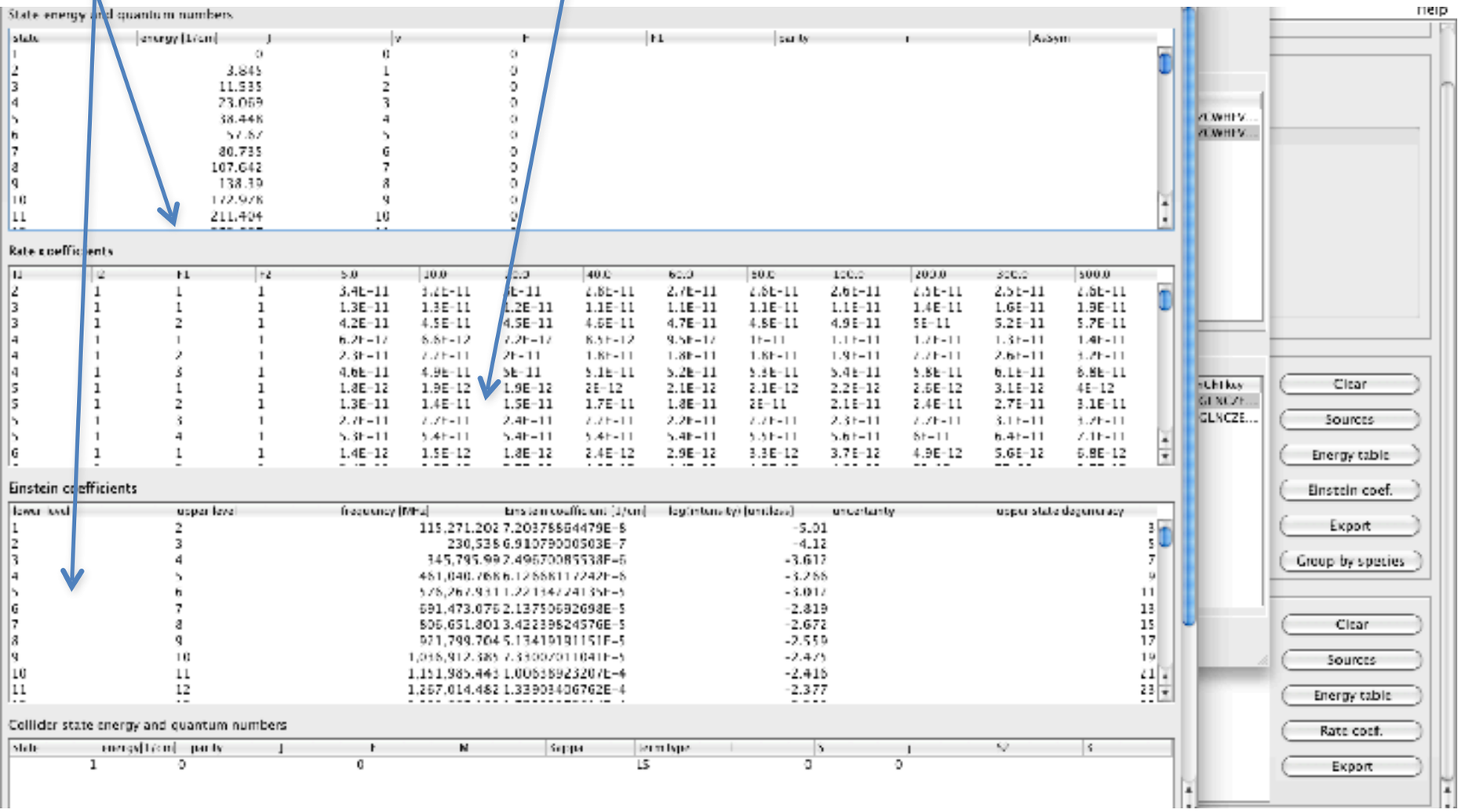
Non-LTE Analysis of Spectra requires
Combined spectroscopic And collision Data

CDMS →

BASECOL →



Spectro and Collisions are combined



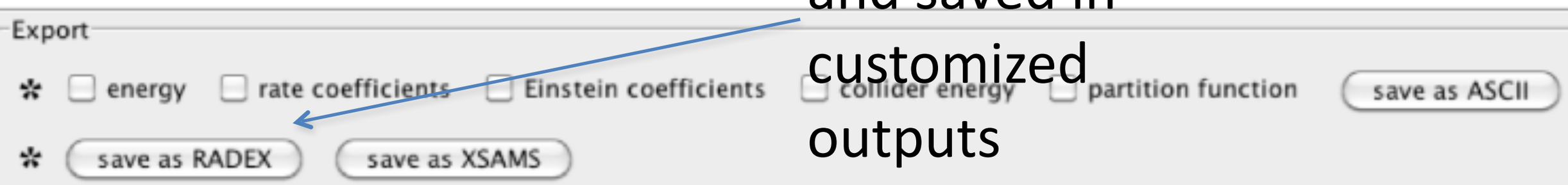
Next Version:

Same query as portal

Find all DB

Send Data to TopCat for visualisation

and saved in customized outputs



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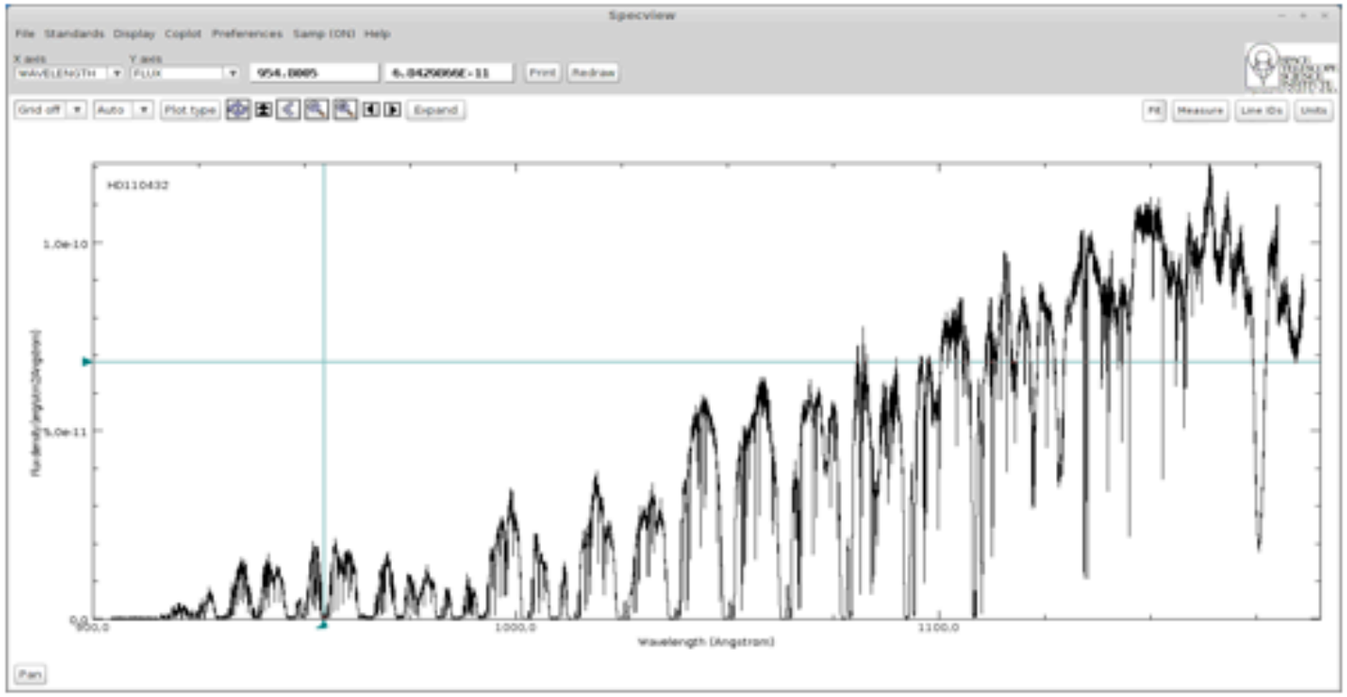
SPECVIEW



Specview is a tool for 1-D spectral visualization and analysis of astronomical spectrograms. It is written in Java thus can be run anywhere Java is supported. **Specview** is capable of reading all the Hubble Space Telescope spectral data formats, as well as data from several other instruments (such as IUE, FUSE, ISO, FORS and SDSS), preview spectra from MAST, and data from generic FITS and ASCII tables. It can also read data from Virtual Observatory servers, and read and write spectrogram data in Virtual Observatory SED format. It can also read files in the SPC Galactic format used in the chemistry field.

Specview can overplot spectral line identifications taken from a variety of line lists, including user-supplied lists. Its linelists' query form has been modified to include the VAMDC Query Module, called QueryBuilder, thus providing the full capability of querying the VAMDC databases. In particular it allows to select finely the observed species and properties of linelists. Currently about 20 spectroscopic databases are inter-connected through VAMDC and accessible through VAMDC software and libraries.

Scientific Use Case +

Tutorial +

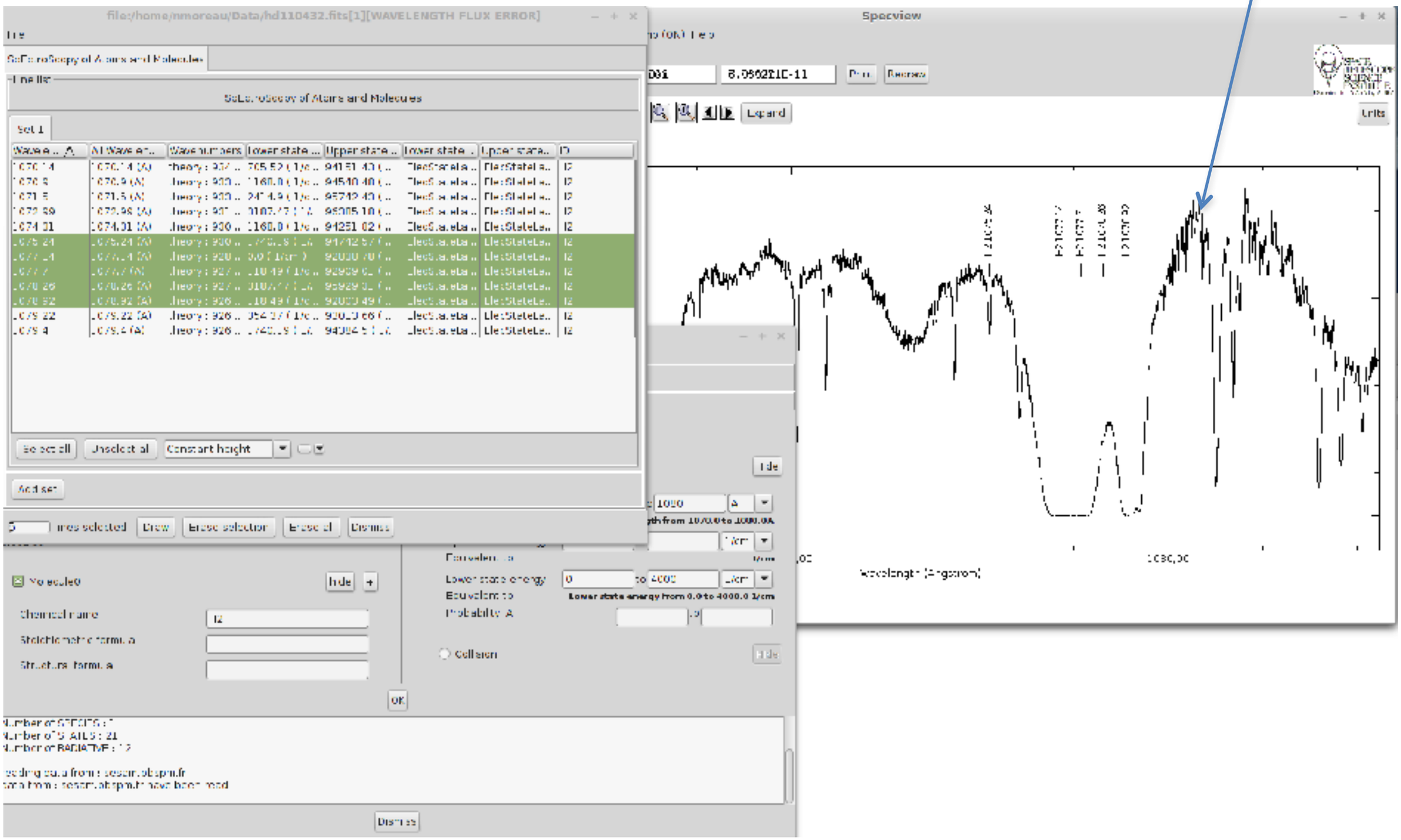
Version History -

Collaboration VAMDC (N. Moreau)
With I. Busko (STScI)

www.stsci.edu/institute/software_hardware/specview/

Accessing VAMDC from User's Tool
Specview Software

SSAP VO



04 Jul 2016 10:34 UT

BAse de données Solaire Sol

BASS2000

Solar Survey Archive

http://bass2000.obspm.fr/

327 MHz | Halpha | CaII K3

Previous day | OK | Next day

Enter a date: Ex: 28/3/2001, 28.3.1, 28-3-01,YYYYMMDD or YYMMDD

en | fr | My Selection

HOME
- Latest observations
- Latest movies
- Long term archive
- News

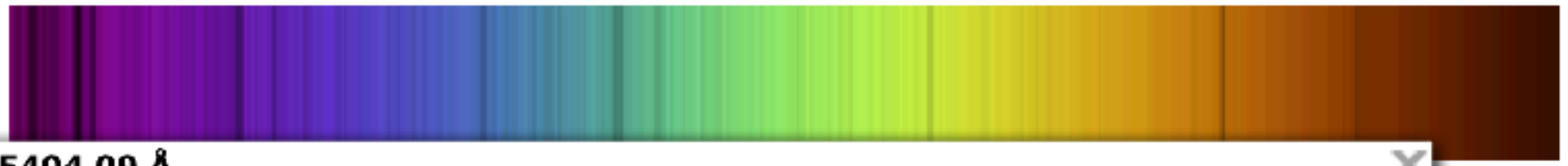
QUERY
- For observati
- For specific
- For solar feat
- For synoptic
- HELIO featur

TOOLS
- Ephemeri
- Solar spec
- Related to
- Live Sun &
- Software

GUIDES
- Instruments
- Data
- Software
- Educational resources (fr)

Collection before 1980
Solar Web Guide
Multimedia Gallery

HIGH RESOLUTION SOLAR SPECTRUM



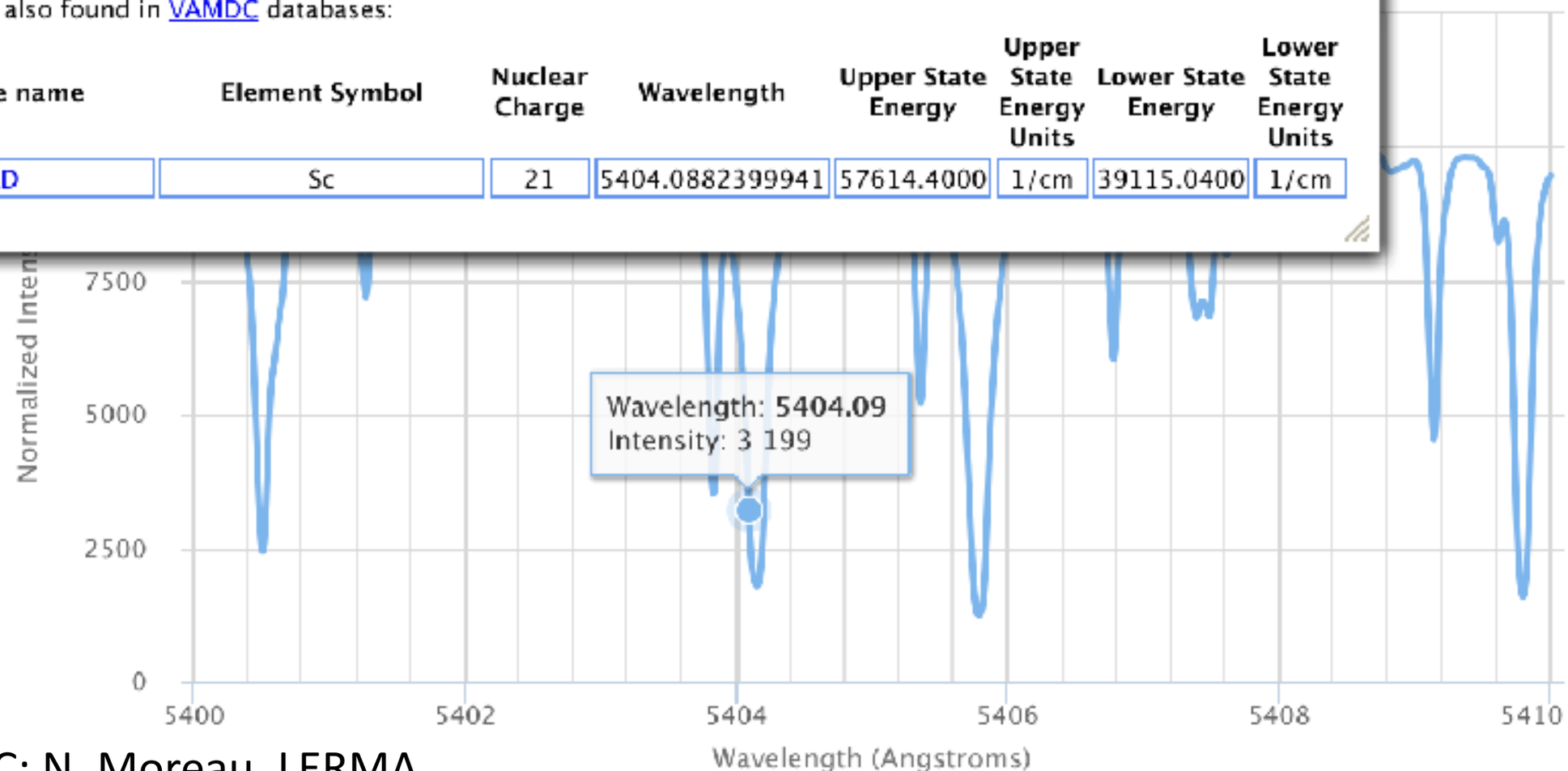
Spectrum 5404.09 Å

Results from NIST Atomic Spectra Database (National Institut of Standards and Technology):

Ion	Observed Wavelength Air (Å)	Ritz Wavelength Air (Å)	Aki (s-1)	fik	Acc.	Ei (cm-1)	Ek (cm-1)	gi-gk
Sc II	5404.085	5 404.090				39 115.04	-57 614.40	3-5

This element is also found in VAMDC databases:

Database name	Element Symbol	Nuclear Charge	Wavelength	Upper State Energy	Upper State Energy Units	Lower State Energy	Lower State Energy Units
VALD	Sc	21	5404.0882399941	57614.4000	1/cm	39115.0400	1/cm



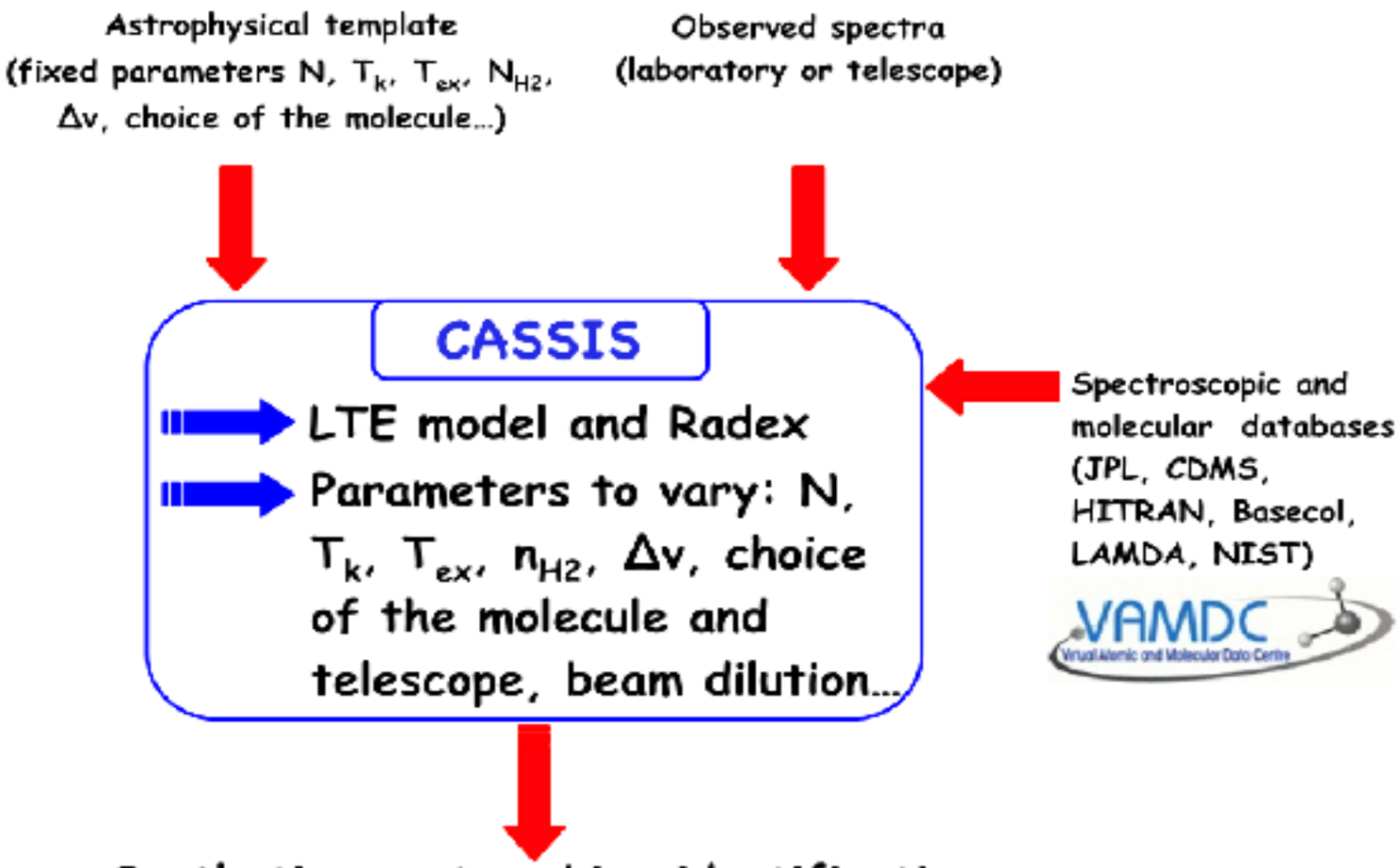
BASS2000 – Observatoire de Paris/Meudon – LESIA

Support from VAMDC: N. Moreau, LERMA

CASSIS Software

M. Boiziot, S. Bottinelli, E. Caux, J.M. Glorian, C. Vastel, IRAP, Toulouse
Y. A. Ba, VAMDC Support, LERMA

The CASSIS (Centre d'Analyse Scientifique de Spectres Instrumentaux et Synthétiques) software has been developed by CESR/IRAP since 2005. All information about it can be found on a dedicated website: http://cassis.irap.omp.eu. The functionalities are represented in the flow chart below:



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- Use of our libraries in user applications in order to access the VAMDC registered databases

- **Include new databases or data in the infrastructure**

Include your data in VAMDC

- Include your data in existing Database connected to VAMDC
  - Contact the DB manager directly
  - Contact VAMDC Support: support@vamdc.eu

- Create a new DB to be connected to VAMDC
  - Contact a node in order to include your DB at their node
  - Contact VAMDC Support : support@vamdc.eu
    - To include at an existing node
    - To create a new node

Tutorials For Data Producers

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TUTORIALS

We provide different tutorial addressed both to data providers and final users.

Follow the links below for further information on each item of the following list:

- General page for Tutorials
- You produce/collect atomic and molecular data and want to include them into VAMDC
  - Outline
  - Self-Study Course
- How to use the VAMDC Portal
  - User Guide for the Portal
  - First Steps with the VAMDC Portal
  - Extracting Data from query results with the viewers
- How to use VAMDC software
  - Spectcol – Readmore
  - Specview – Readmore
  - PDL-VAMDC – Readmore
  - The XSAMS file format and TAP Validator application (mainly for the data providers)
  - Python Scripting
  - Using VAMDC Java libraries
  - You want to check XSAMS files, TAPValidator – ReadMore

ACCESS TO THE DATA

Access to VAMDC databases

Access to the portal

ACCESS TO THE FORUM

Exchange ideas, Ask questions, Find answers

Read more

or

Access to the forum

Advantages of Inclusion in VAMDC

- Each Data is precisely described and referenced
  - Allows to check consistancy of Databases
- Methodology to obtain data can be included
- Uniform query and visualisation
  - Similar Databases can be compared
- Allows visibility of small databases, groups'work
- Allowed new paragdim for existing DB: CDMS, HITRAN

Duties for VAMDC connected Databases' managers

- Have a technical manager and a scientific manager
- Check technical quality with respect to VAMDC
  - Be compliant with VAMDC
- Check scientific quality of databases output through VAMDC
- Provide information about your database and your group
- For those who are not members, but hold resources: be aware of VAMDC regulations

We provide on-line and face-to-face support

- To include your data and your databases
- To implement our « modules » in your software
- To use our software, our standards

➢ We can organize tutorials

➢ We can support visits for the purpose of implementation

➢ We have communications channels that are available to all

EVENTS

Conferences
Research
Education
Industry
Outreach

Workshops
Research
Industry

Tutorials

« 1 2 3 »

2015/08/28 - 2015/08/29 - 2015 Annual « VAMDC Consortium » Workshop
Workshops
The 2015 Annual "VAMDC Consortium" Workshop will be held after the HRMS conference from Friday 28th August (afternoon) till Saturday 29th August. The Saturday's sessions are internal VAMDC meetings only. Friday's sessions are opened.
Read more

2015/08/24 - 2015/08/28 - 24th Colloquium on High Resolution Molecular Spectroscopy
Conferences
The Twenty Fourth Colloquium on High Resolution Molecular Spectroscopy that will take place in Dijon, France, on August 24-28, 2015.
Read more

2015/08/03 - 2015/08/14 - XXIX General Assembly IAU 2015
Conferences
XXIX General Assembly IAU (http://astronomy2015.org), Hawai, August 3–14, 2015
Read more

2015/06/15 - 2015/06/19 - 10th Serbian Conference on Spectral Line Shapes in Astrophysics
Conferences
SCSLSA 2015, June 15-19, 2015 — Srebrno jezero, Serbia
Read more

2015/06/15 - 2015/06/19 - VAMDC at spring 2015 Interop in Sesto
Conferences
The IVOA is an organisation aiming at creating interoperability standards to publish and exchange astronomical data. It will held a meeting in Sexten, Italy, between

RESEARCH NEWS

Software
Standards
Publications

Save the figure

2014/09/01 - SPECTCOL 4th Release
software
Version 12.07-r2
Read more

2013/12/01 - SPECTCOL 3rd release
software
Version 12.07-r1
Read more

2011/05/27 - Standards 1rst release
standards
Version 11.05
Read more

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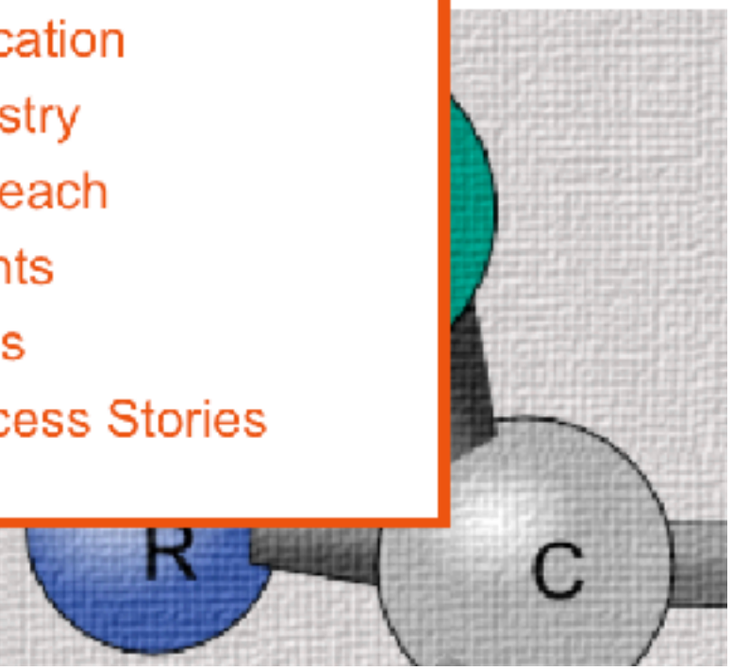
ESEARCH P
ine for VAMDC data



AstroAtom
Partners blog
News from AstroAtom
See the blog

Populär Astronomi
Partners blog
Populär Astronomi Blog in Swedish
See the blog