

Volcanic Gas Emission Measurements Using Tunable Mid-IR DFG Based Sensors



RICE



Dirk Richter, Dirk Rehle, and Frank K. Tittel

Laser Science Group, Rice University, USA

<http://www.rice.edu/~lasersci>

Clive Oppenheimer, Hayley J. Duffell, Rodney L. Jones

Volcano Remote Sensing Group, University of Cambridge, UK

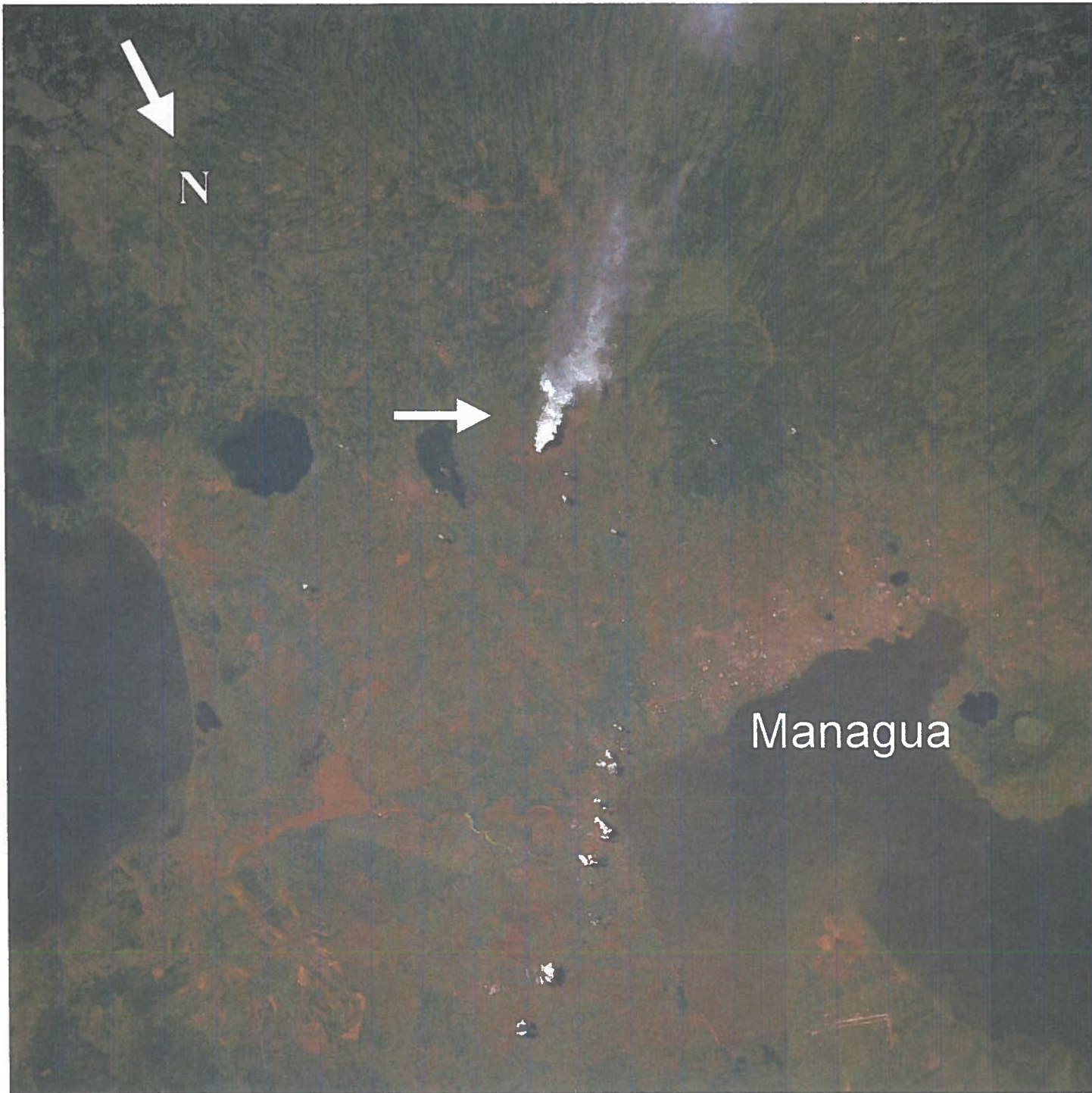
<http://www.geog.cam.ac.uk/intro/activ/volcano/volcano.htm>



SISTEMA
POSEIDON

Mike Burton

Sistema Poseidon, 95030 Nicolosi, Catania, Italy



Masaya

Volcano

from

Space



Crater diameter:
500 m

Last Strombolian
Explosion: 1997

Current degas rate:

HCl ~ 20 kT/hour

SO₂ ~ 60 kT/hour

For comparison:

Total SO₂ release in UK:

~0.2 kT/hour in 1998



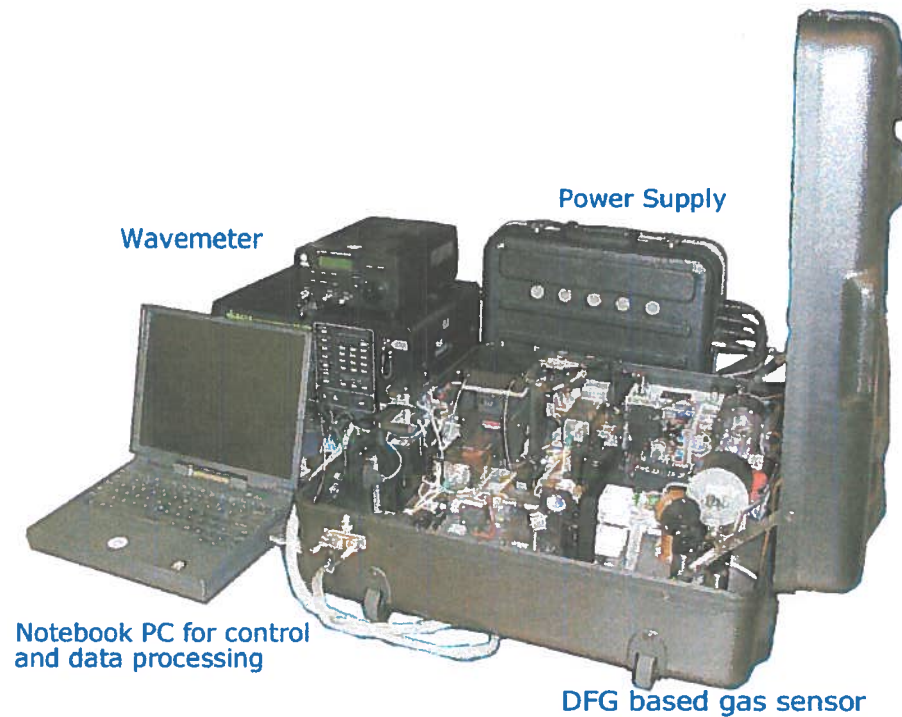
► FTIR

- Resolution: 0.5 cm^{-1}
- Tuning range: $500 - 6000 \text{ cm}^{-1}$
($1.7 - 20 \text{ }\mu\text{m}$)

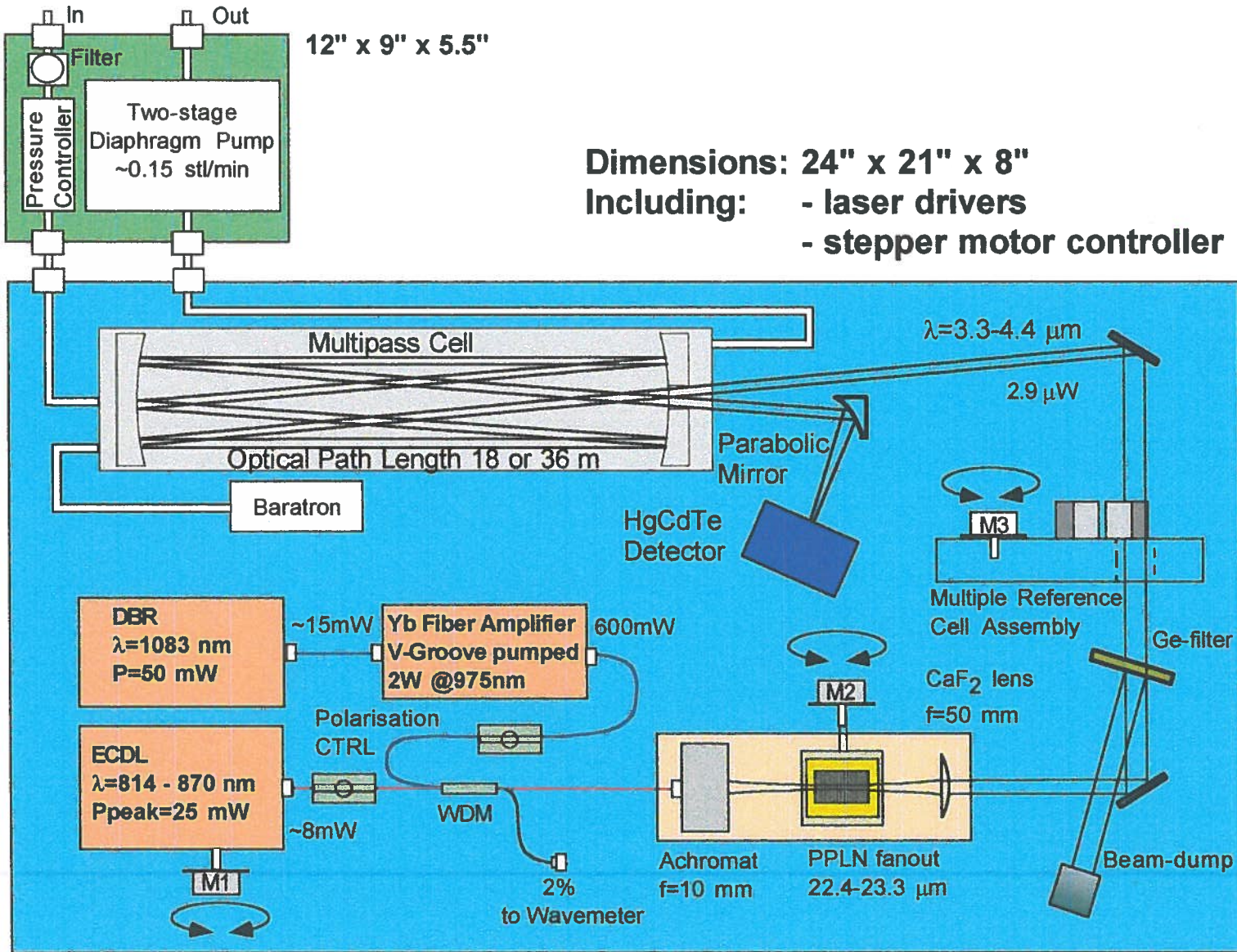


► DFG Based Gas Sensor

- Resolution: 0.0013 cm^{-1}
- Tuning range: $2270 - 3000 \text{ cm}^{-1}$
($3.3 - 4.4 \text{ }\mu\text{m}$)

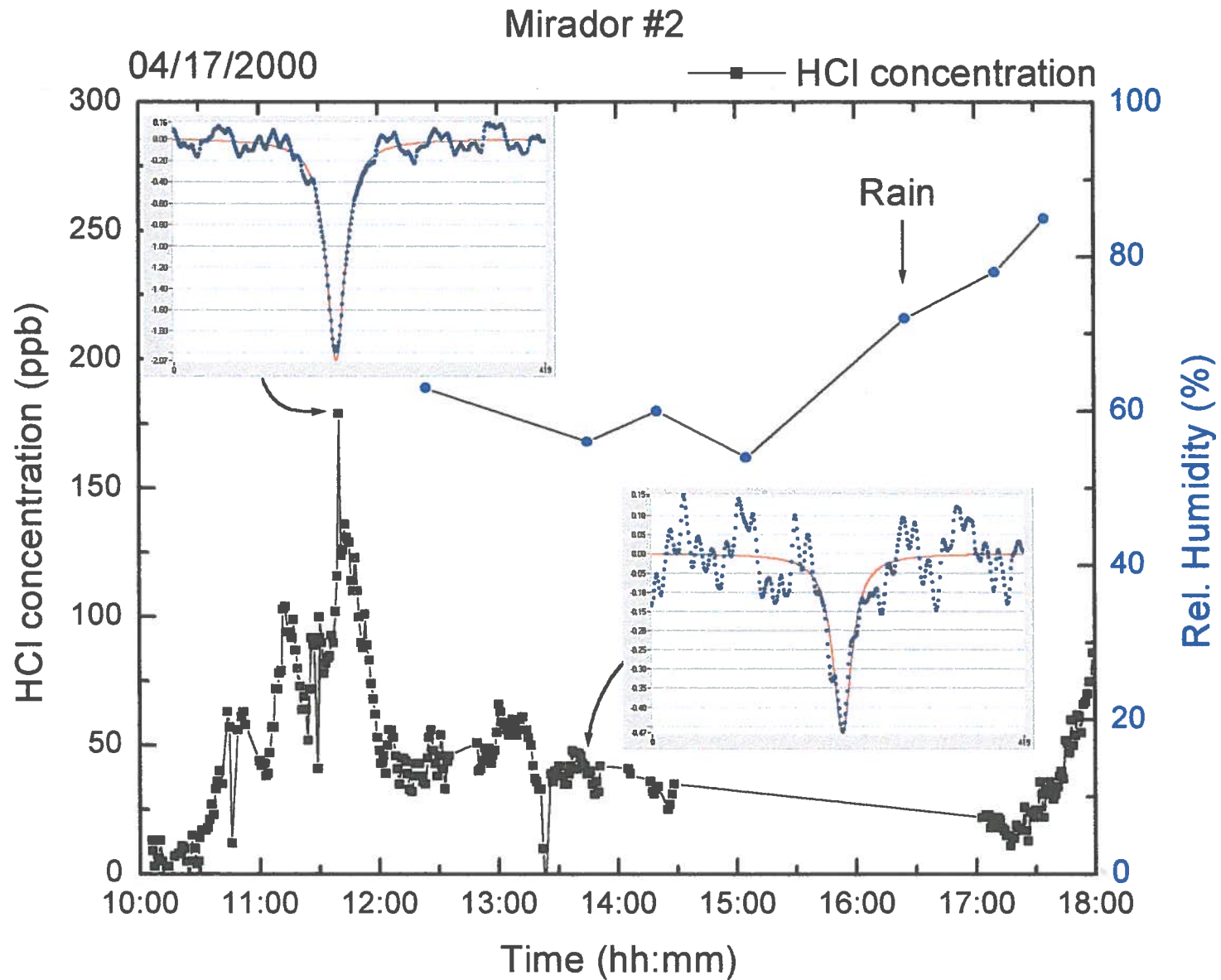


► Schematic of DFG Based Gas Sensor

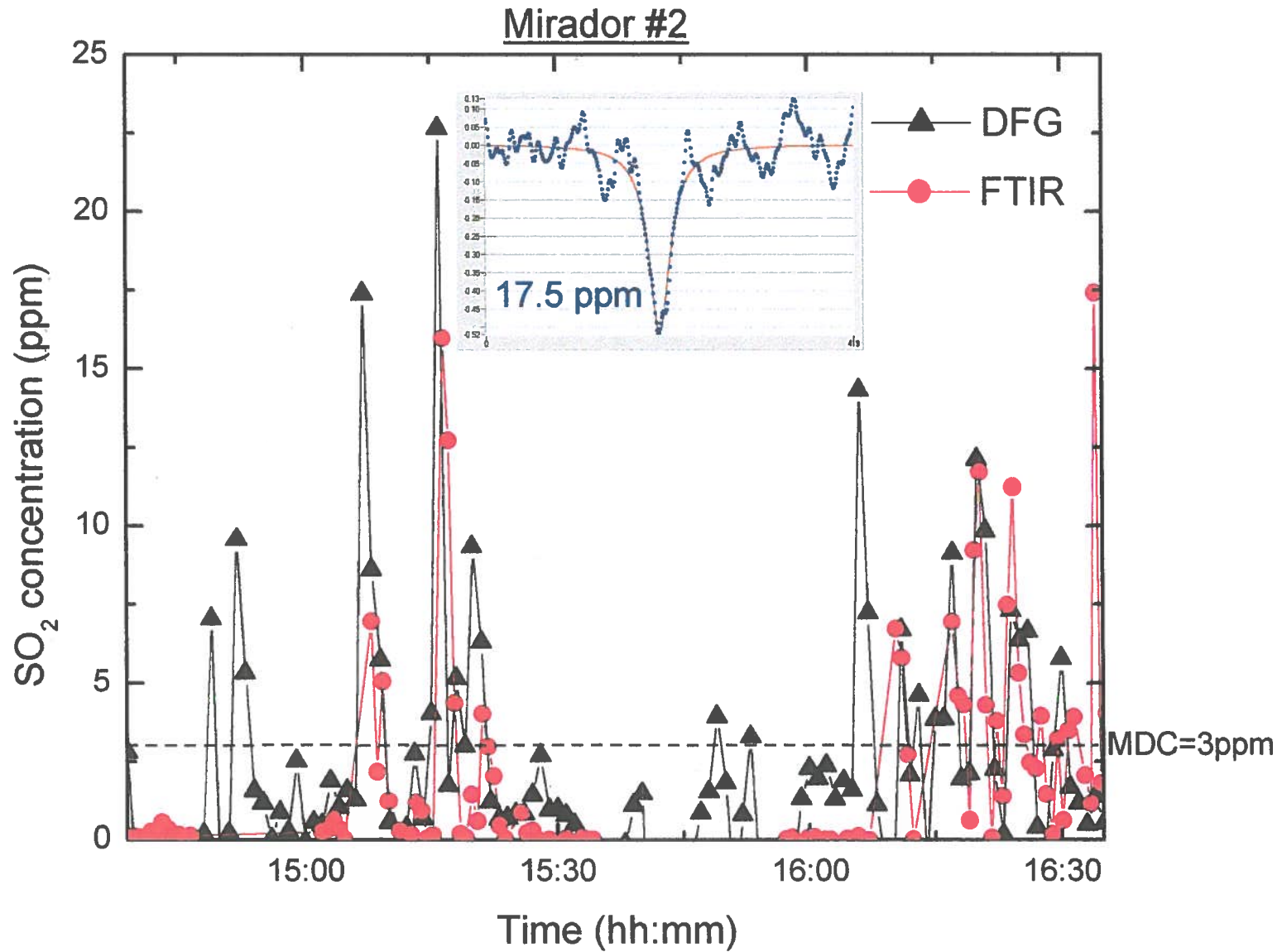


D. Richter, D.G. Lancaster, F.K. Tittel, Appl. Opt. 39, 4444-4450 (2000)

► Detection of HCl at 3.3 μm



► Detection of SO₂ at 4.2 μm



▶ Summary

- Fiber based DFG gas sensors
- Single and multi-species detection
- Highly sensitive and selective
- Robust field portable technology

Mature technology, ready for use in:

Laboratory, field, industrial and airborne applications