

## Call for collaboration program of remote sensing of CO<sub>2</sub> column density with use of a Fiber Etalon Sun-photometer

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Meisei Electric Co.,Ltd has developed a fully-automated and handy solar spectrometer to evaluate the CO<sub>2</sub> column density using optical fiber technology, **FES-C** (Fiber Etalon Sun-photometer for CO<sub>2</sub>)

Meisei Electric Co.,Ltd seeks collaboration programs that measure atmospheric CO<sub>2</sub> column densities. Science and engineering teams are welcome to apply this collaboration program.

This program is financially supported by the Japan Science and Technology Agency, Ministry of Education, Science, Culture and Sports of Japan. <http://www.jst.go.jp/sentan/en/index.html>

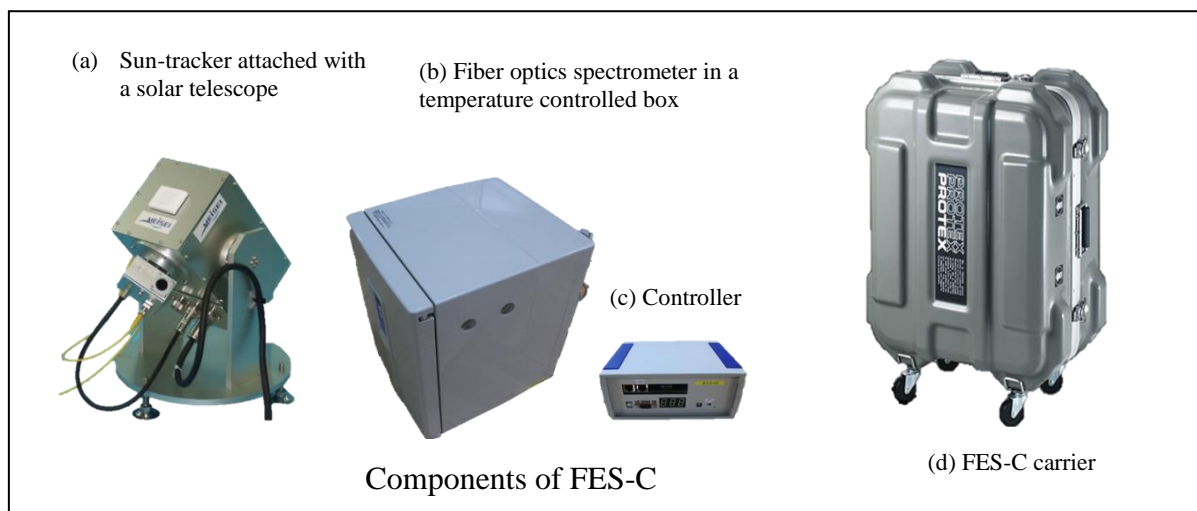
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*Meisei Electric Co.,Ltd of the IHI group manufactures sensing and communication instruments for environmental measurement system, meteorology, hydrology and geophysics research.*

<http://www.meisei.co.jp/english/>

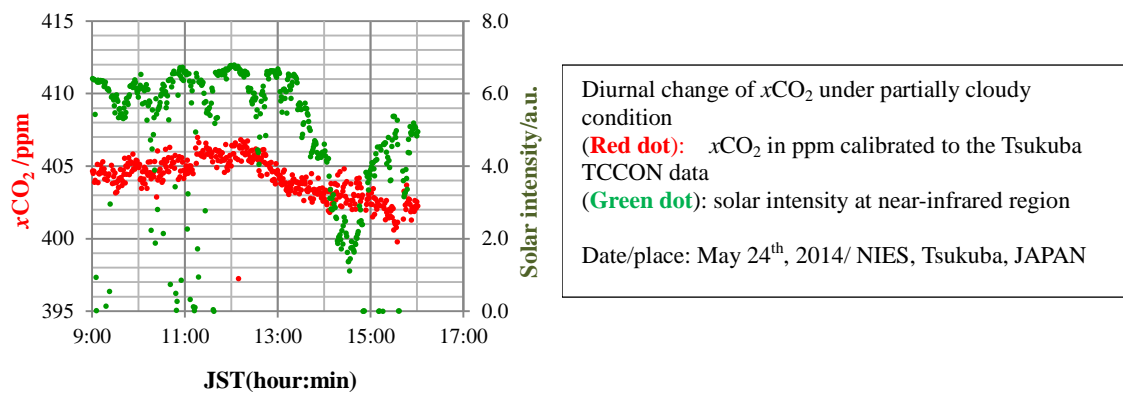


*Reference:* M. Kawasaki, M. Ohashi, G. Inoue, *SPIE Newsroom*, 10.1117/2.1201301.004659  
This paper reports performance of a prototype FES-C model under wild fire occasions in the Kalimantan Province, Indonesia. Note that the present Meisei model provides much stable data.

## Detailed Information about FES-C instrument

Greenhouse gases in the atmosphere absorb the near-infrared solar radiation and the spectral absorbance has information on their concentrations. The FES-C spectrometer consists of an optical fiber-based spectrum analyzer with a resolution enough to resolve the CO<sub>2</sub> rotation lines. Direct sunlight is collected by a fiber collimator installed on a sun tracker and transmitted through a single-mode optical fiber into the spectrum analyzer to obtain optical density data caused by atmospheric CO<sub>2</sub>. The data are converted to the CO<sub>2</sub> column densities by means of spectral simulation analysis.

Figure shows a diurnal change of  $x\text{CO}_2$  under partially cloudy conditions, which was measured in collaboration with the National Institute for Environmental Studies (NIES) in Tsukuba-City, Japan.



## FES-C instrument and requirements to a monitoring site

1. FES-C is composed of three parts, (a) a sun tracker with a fiber collimator, (b) a temperature controlled box that contains fiber etalon optics and electronics, (c) a controller/data logger. Total weight of 30 kg. FES-C can be packed in two carry cases.
2. The sun tracker should be installed on a place where the sun is visible from 9 am to 3 pm LT. The cables for electric/signal lines and an optical fiber connect the outdoor parts with the indoor parts through a hole of 50 mm diameter. Installation can be completed in a day.
3. Total electric power requirement is 200 W in operation and 300 W at starting. The temperature control box is better to place in an air-conditioned room below 34°C.
4. FES-C is suitable for use in field measurements, especially under a remote area, because of easy handling and maintenance, and low running cost.

### References

1. E.L. Wilson *et al.*, *Meas. Sci. Technol.*, **18**, 1495 (2007)
2. N. Kobayashi *et al.*, *Atmos. Meas. Tech.*, **3**, 1 (2010)