

## OR2-2

TEXUS 観測ロケット 60 号機を用いた液滴冷炎に関する微小重力実験 (*Phoenix-2*) 実施概要Outline of the Microgravity Experiments on Droplet Cool Flame (*Phoenix-2*) Using TEXUS Sounding Rocket #60

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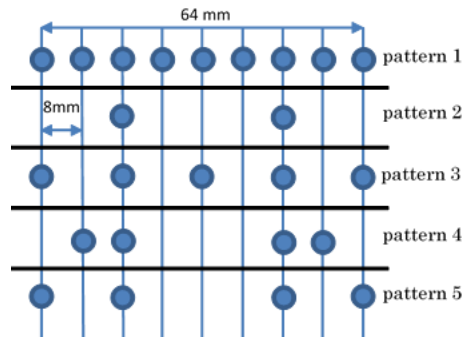
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The TEXUS-60 sounding rocket experiments on droplet cool flame had been planned and defined as the core activity of the Japan-German joint research project, *Phoenix-2*. The project is recognized as one of the JAXA-DLR collaborative sounding rocket experiment since 2017. Preparative work had been done as a Front-loading Research by ISAS Space Utilization Science Committee. The flight model development and the flight campaign have been promoted by ISAS Small Scale Project and Nihon University President Grant Initiative. Cool flame is a low temperature flame that leads the spontaneous ignition of hot flame. The cool flame dynamics is investigated, for it controls the ignition, and hence, abrupt heat release that may destroy combustors. In the flight experiments, five patterns (Fig. 1) of fuel droplet array are generated onto fine SiC suspenders and are inserted into two furnaces of different temperature (590 / 570K) to spontaneously ignite cool flames. *n*-Decane is employed as fuel, for it is the major component of SAF (Sustainable Aviation Fuel) and is known to have cool flame. Air at atmospheric pressure is used as the ambient. The induction time, the location of flame onset, burning rate and other dynamical characteristics of cool flames are planned to be determined through high-resolution back-lit imaging and high-speed HCHO luminescence imaging as a cool flame marker. The experimental module, DCU-2 is developed by the Japanese team and the German team developed the cool flame direct-imaging system and the bus-module. The sounding rocket was launched in March, 2024 at the Esrange Space Center (Table 1). The planned data was successfully obtained for the furnace with the lower

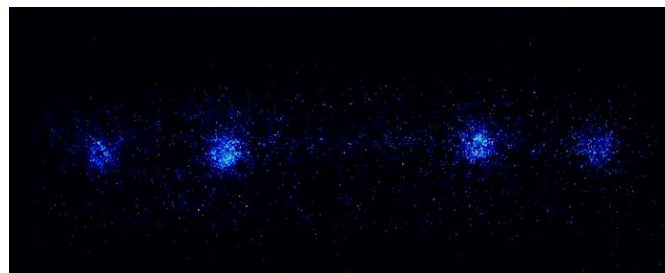
temperature. Cool flame was found to spontaneously ignite at the furnace at 570K, being the lowest temperature ever achieved, for the sufficiently long microgravity duration of the rocket experiments (Fig. 2). The outline of the experiments and the steps to the launch is going to be presented.



**Figure 1.** Tested droplet arrangement.

**Table 1.** TEXUS-60 flight summary.

Launch Site	Esrance Space Center, SSC
Launched	09.45 (UTC) 24 March 2024
Rocket Type	VSB-30
Payload Mass	400 kg
Apogeu	251.7 km



**Figure 2.** Spontaneously ignited cool flames as a HCHO luminescence image (false color, 570 K, pattern 5).

## Acknowledgements

This study is supported by ISAS-JAXA *Small-Scale Project, The Front-Loading Project*, JSPS *KAKENHI* Grant Number 17K06950, 19K04843, and 21K14347, 24K07887, and by Nihon University *President Grant Initiative*. The authors express sincere gratitude to DLR and Airbus team for their outstanding contributions.



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