



Re-entry event of CZ-3B R/B observed by all-sky meteor cameras AMOS

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5th Space Debris Re-entry Workshop

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Virtual | 2nd of December 2020





Overview

- AMOS and AMOS-Spec systems
- CZ-3B event
- Preliminary analysis
- Future work

Video measurements



- All-Sky Meteor Orbit System - AMOS
- Program active since 2007
- Two parallel programs, AMOS Cam and AMOS-Spec
- **AMOS-Cam**, primary focus:
 - orbit determination
 - brightness extraction
 - association with meteor streams
 - identification of new streams, parent bodies
 - meteorite recovery
- **AMOS-Spec/-HSpec**, primary focus:
 - spectra observation and analysis



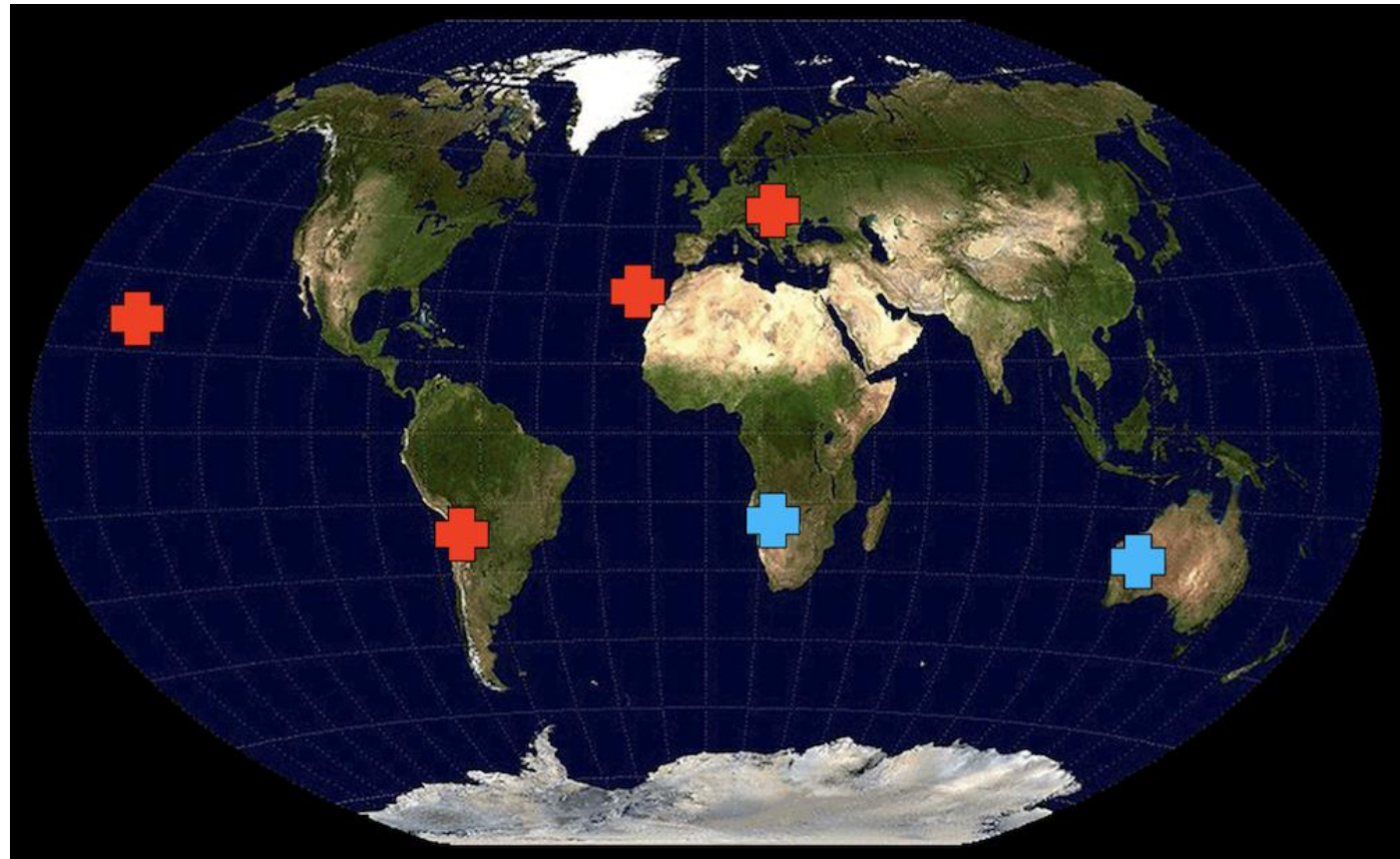
AMOS network



- Slovak Video Meteor Network 2009 – 4 AMOS-Cam, 1 AMOS-Spec, 1 AMOS-HSpec
- Canary Islands 2015 2 AMOS-Cam, 1 AMOS-HSpec
- Chile, Atacama 2016 2 AMOS-Cam, 2 AMOS-HSpec
- Hawaii, 2018 2 AMOS-Cam, 1 AMOS-Hspec

- 21 hours per day coverage
- North and South stations

- Planned Australia, South Africa/Namibia



CZ-3B event

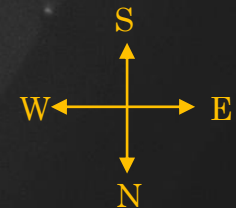


Start of event: 2020-10-25T08:01:37 UTC

Event captured by 3 AMOS cameras, 2 all-sky, and AMOS-SpecHR

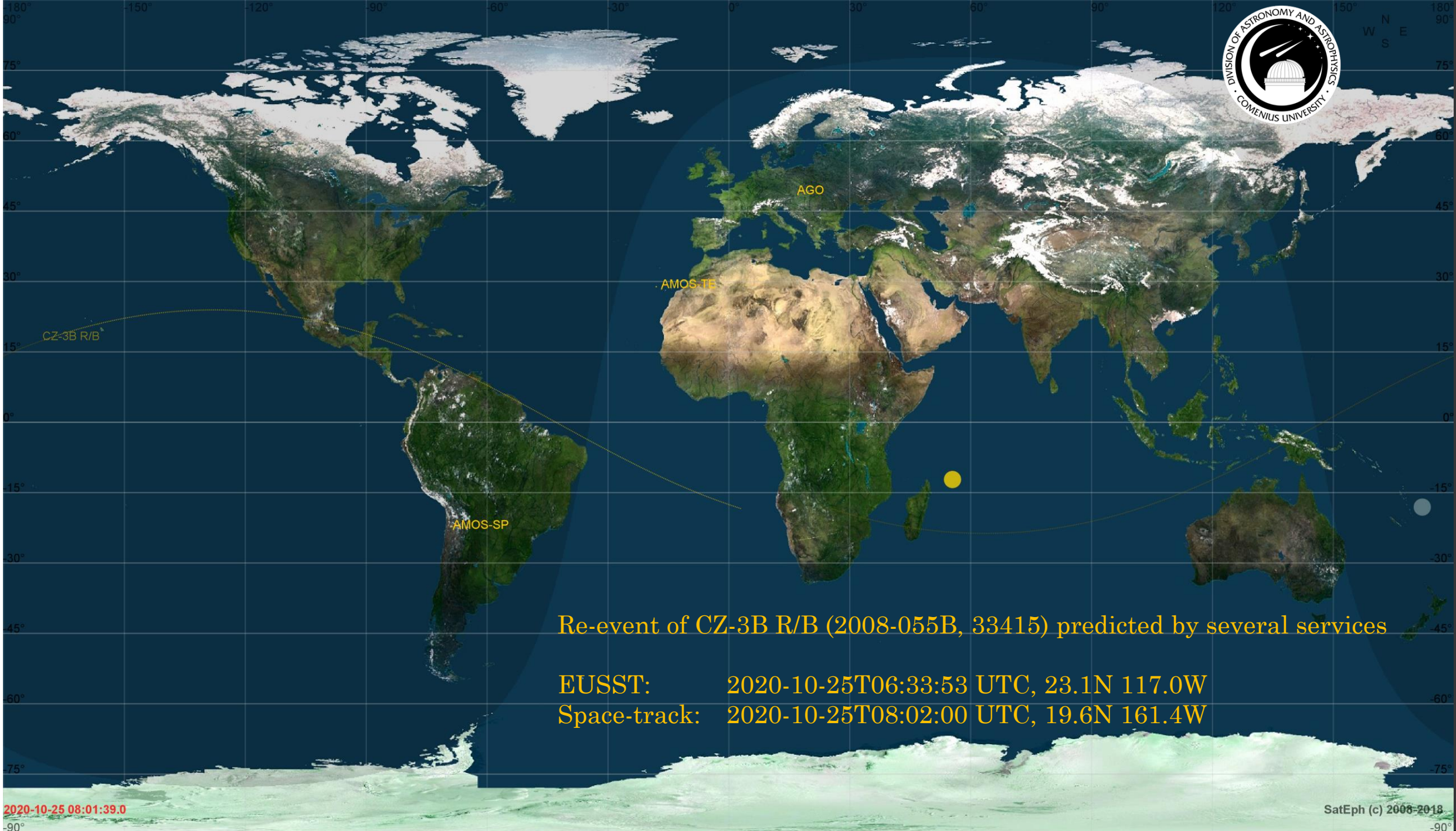
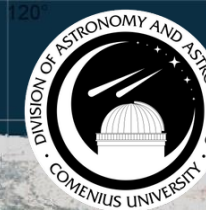


2020/10/25 08:01:37.927



0007

V00004+118 AMOS-MK



Re-event of CZ-3B R/B (2008-055B, 33415) predicted by several services

EUSST: 2020-10-25T06:33:53 UTC, 23.1N 117.0W

Space-track: 2020-10-25T08:02:00 UTC, 19.6N 161.4W

2020-10-25 08:01:39.0

SatEph (c) 2008-2018



All-sky HK video



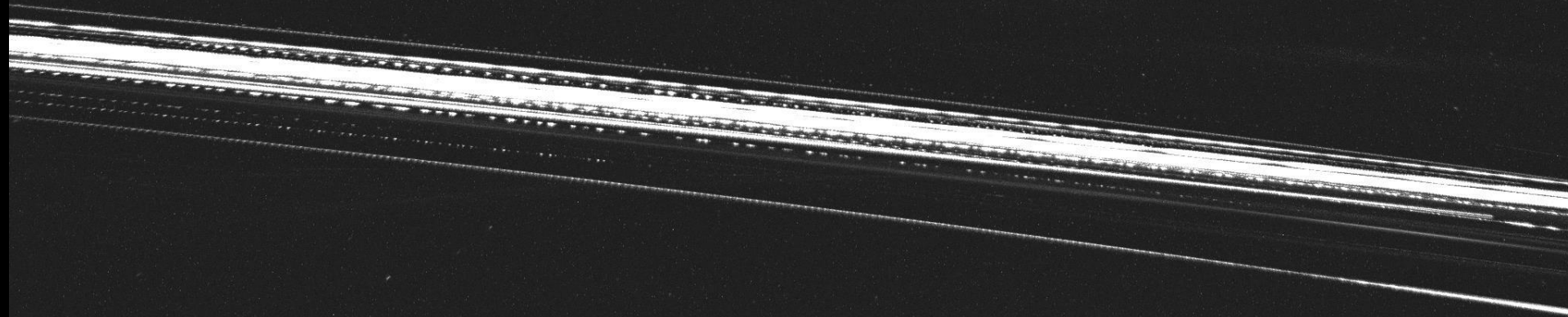


All-sky MK video

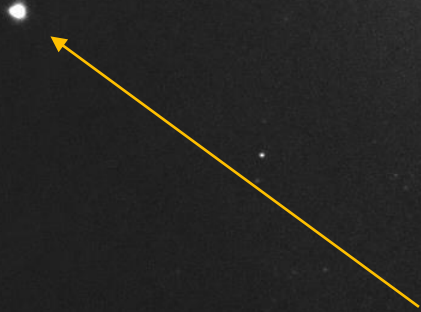




SpecHR MK video



All-sky HK video, fragmentation?



2020-10-25T08:00:36 UTC



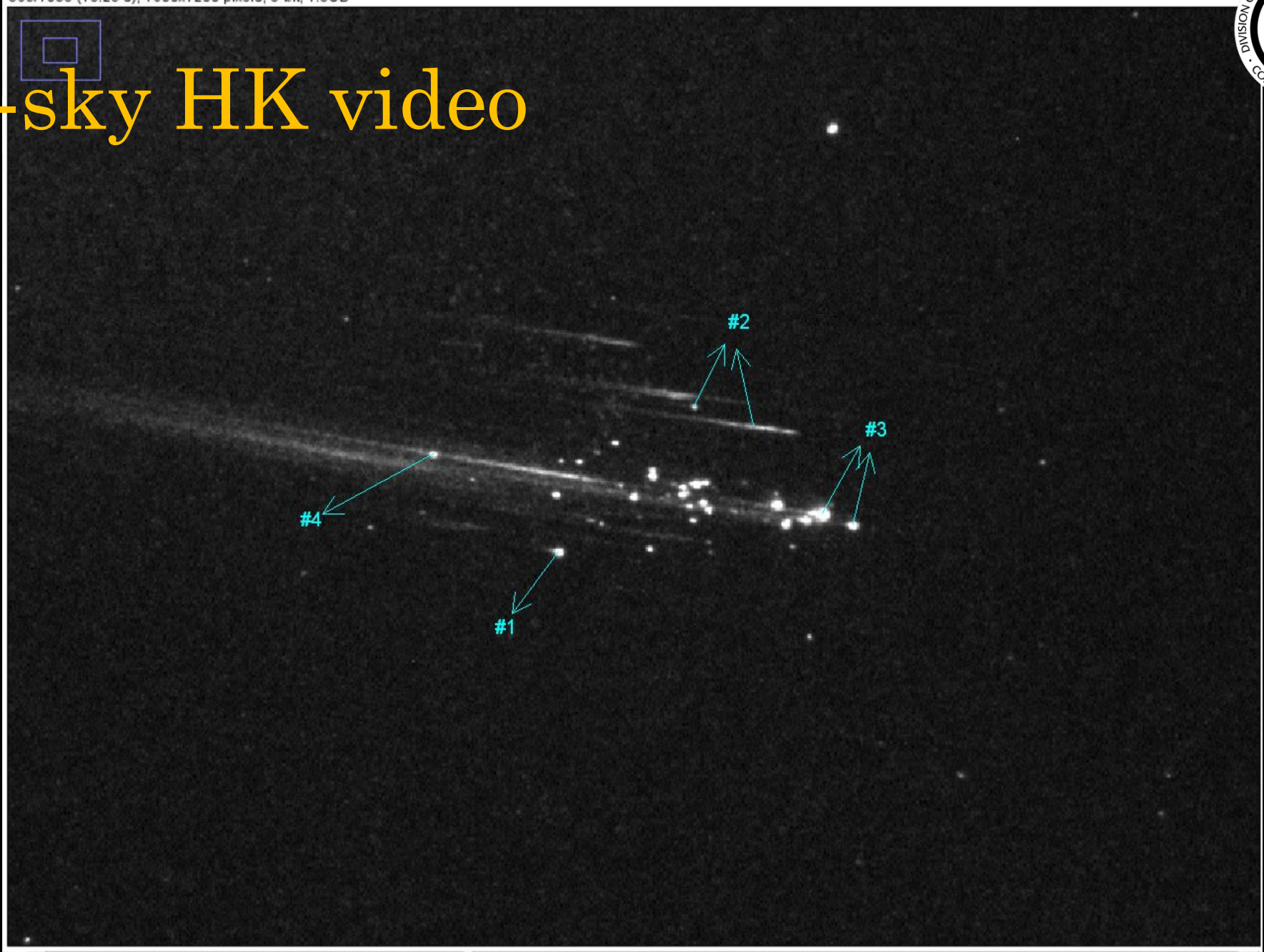


Preliminary analysis

- Selected has been two fragments, easy to distinguish on both all sky cameras
- Fragments “1” and “3”, calculated the atmospheric trajectory, velocity and brightness
- Predicted possible impact area for selected targets
- Extrapolated the trajectories to the moment of possible fragmentation, explosion at 2020-10-25T08:00:36 UTC

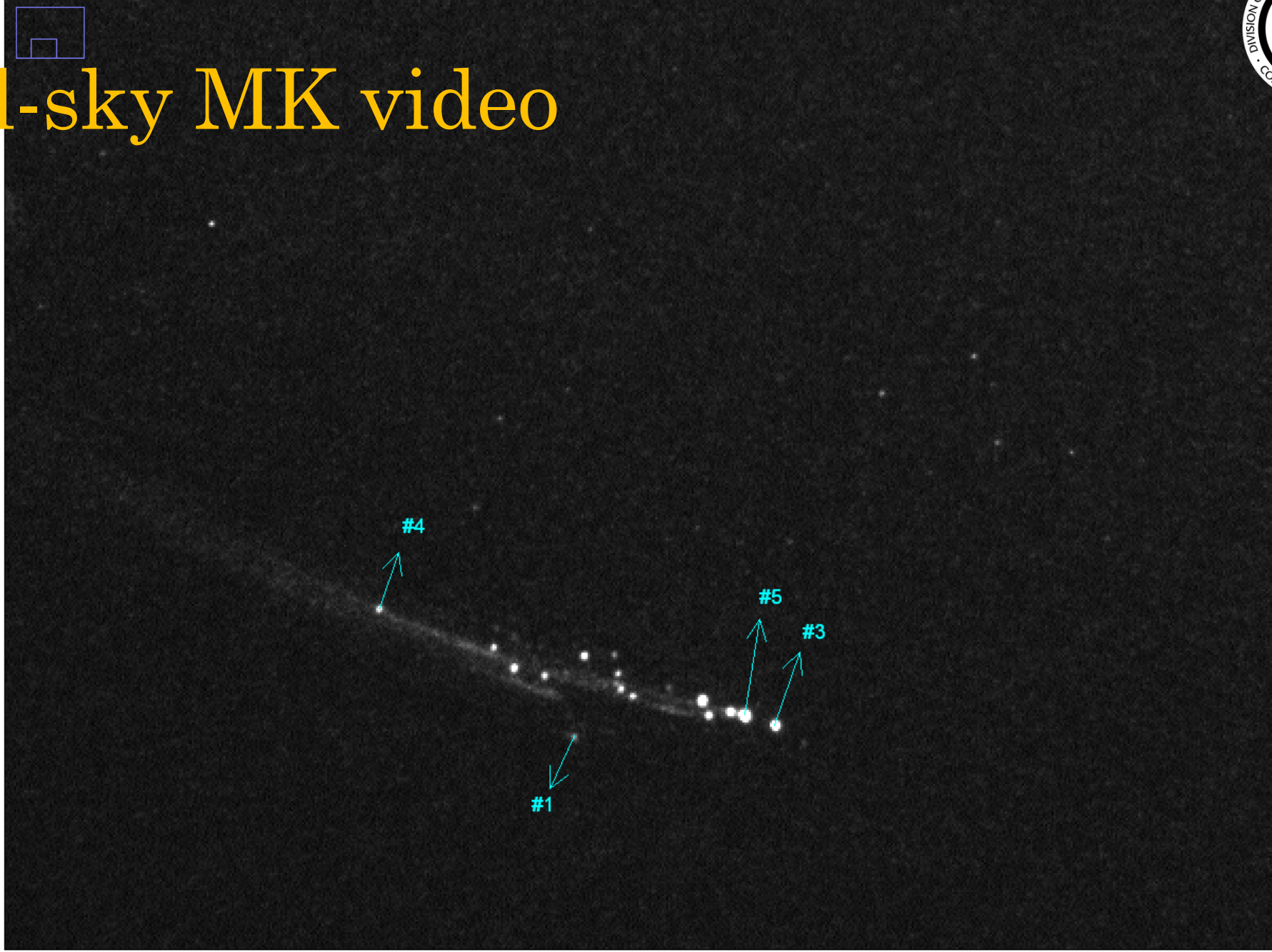


All-sky HK video





All-sky MK video





Kailiu Canyon

Kaua'i

Niihau

O'ahu

Honolulu

Waialeia Canyon

Moloka'i

Penguin Bank

Lana'i

Maui

AMOS-HK

Kaho'olawe

Hawai'ian Islands

Rainier Seamount

Hawa'i

AMOS-MK

Island of Hawai'i

Powers Seamount

Palaoa Knoll

Green Seamount

76.7km

Hawaiian Trough

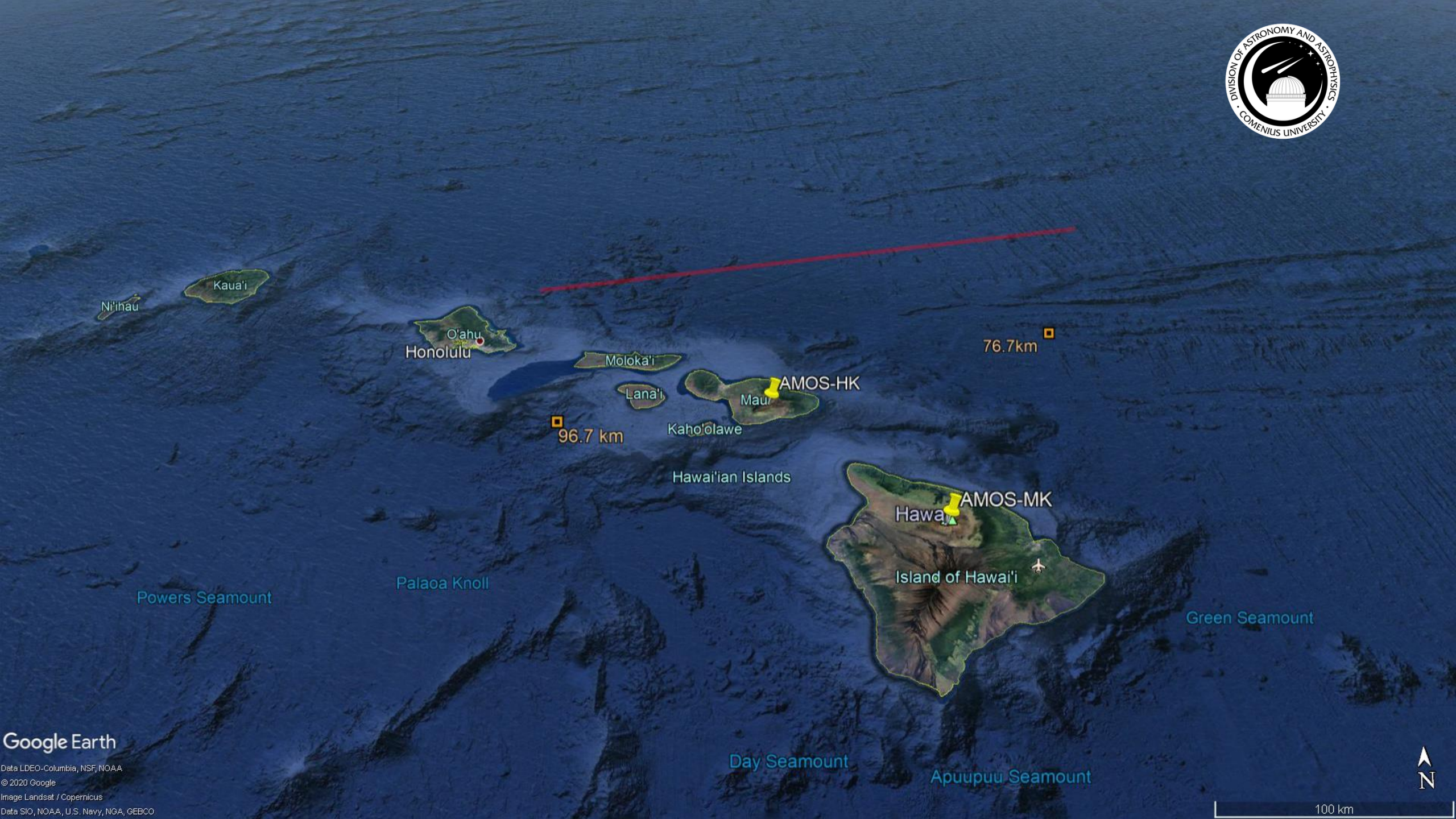
96.7 km

Google Earth

Data LDEO-Columbia, NSF, NOAA
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100 km



Google Earth

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100 km



Oahu
Honolulu

96.7 km

Molokai

Lana'i

Kahoolawe

Hawaiian Islands

AMOS HK
Maui

76.7 km

Hawaj

AMOS MK

Island of Hawai'i

Hilo

McCall Seamount

Day Seamount

Dana Seamount

Apuupuu Seamount

Pearl Seamount

Lohi Seamount

Honohou Seamount

Google Earth

Data LDEO-Columbia, NSF, NOAA
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40 km





2020-10-25T08:02:37 UTC

Range ~ 450±15 km

2020-10-25T08:01:36 UTC

Fragmentation

96.7 km

AMOS-HK

76.7 km

Impact Impact Impact Impact

AMOS-MK
Hawa

Altitude ~ 100±1 km





Future work

- Using also data from AMOS-SpecHR
- More fragments for analysis – trajectory, brightness, impact area, size and mass distribution
- Geocentric solution
- Modeling of the event with re-entry tools, comparison of



Thank you for your attention.



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