CONNECTING METEORS AND METEORITES: FLIGHT TRACK, SPECTRA, FINDING AND LABORATORY ANALYSIS – SUGGESTION FOR A COLLABORATIVE ACTION

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INTRODUCTION, RATIONALITY

- idea: discussion with Martin Ferus (Czech Academy of Sciences)

<u>Work toward</u>: joined European network of meteor observatories, experimental laboratories and geologists.

Existing capacities (Hungary, Czechia, Greece):

- meteor cameras in Europe
- radio observations (SID monitoring and radars).
- meteor spectra observations
- meteorite analysing laboratory facilities
- plasma laboratory facilities

Fast progress in last decade:

- separated projects on the „same meteor” targets
- suggestion for joining forces (from „geology domain”)

INTRODUCTION, RATIONALITY

- But who is this newcomer guy (me) to suggest what IMO members *have already thought a lot about*?

DEMONSTRATE INTERDISCIPLINARY SYNERGY: EXAMPLE PROJECT

Hungary, national funding GINOP *(„Cosmic based risks")* project

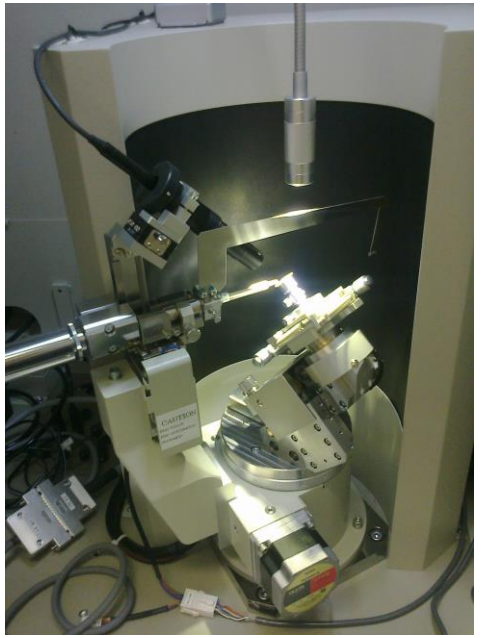
- Near Earth asteroid follow-up and discovery
- fireball cameras → occurrence, frequency, high temporal resolution lightcurve
- lunar impact flash observation (0.8 m telescope) → impact occurrence, frequency
- ionsonde (ionosphere analysis) → meteor plasma channel
- lunar crater analysis (recent impacts) → improve bombardment rate
- laboratory meteorite sample analysis → provide data for composition of Earth bombarding objects

Nice sinergy … would be interesting to have **resemble at internatonal level** related to „IMO community"

EXISTING DATA FROM LABORATORY FACILITES

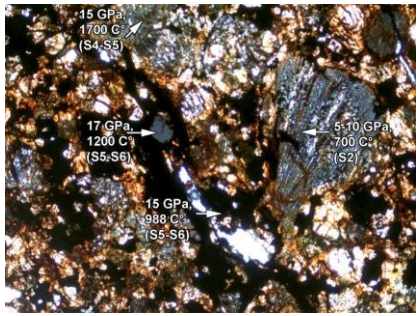
Existing background:

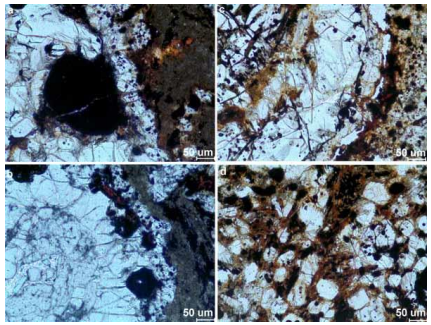
- optical, infrared, X-ray, Raman, laser, spectroscopes… (mainly non destructive analysis)
- range of meteorite samples + mineral references materials are accessible

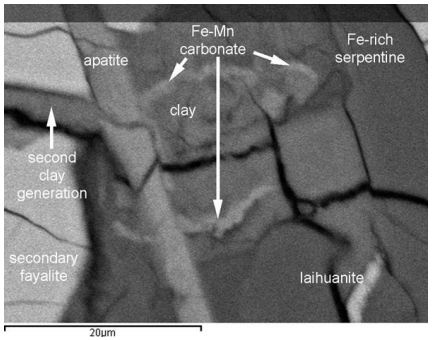


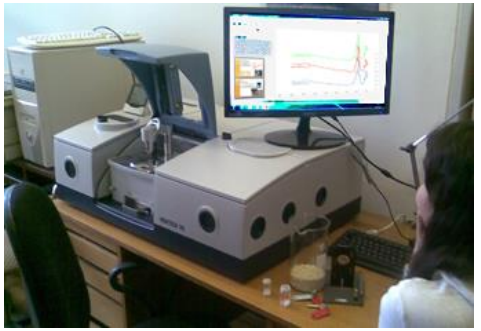
Analysis could provide:

- elemental composition → element ratio
- spatial heteorgeneity → lightcurve
- laser ablation tests → ratio of released elements

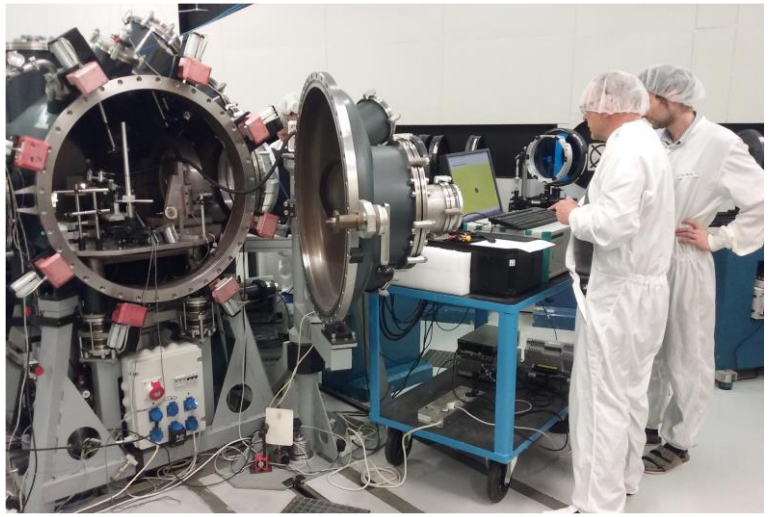


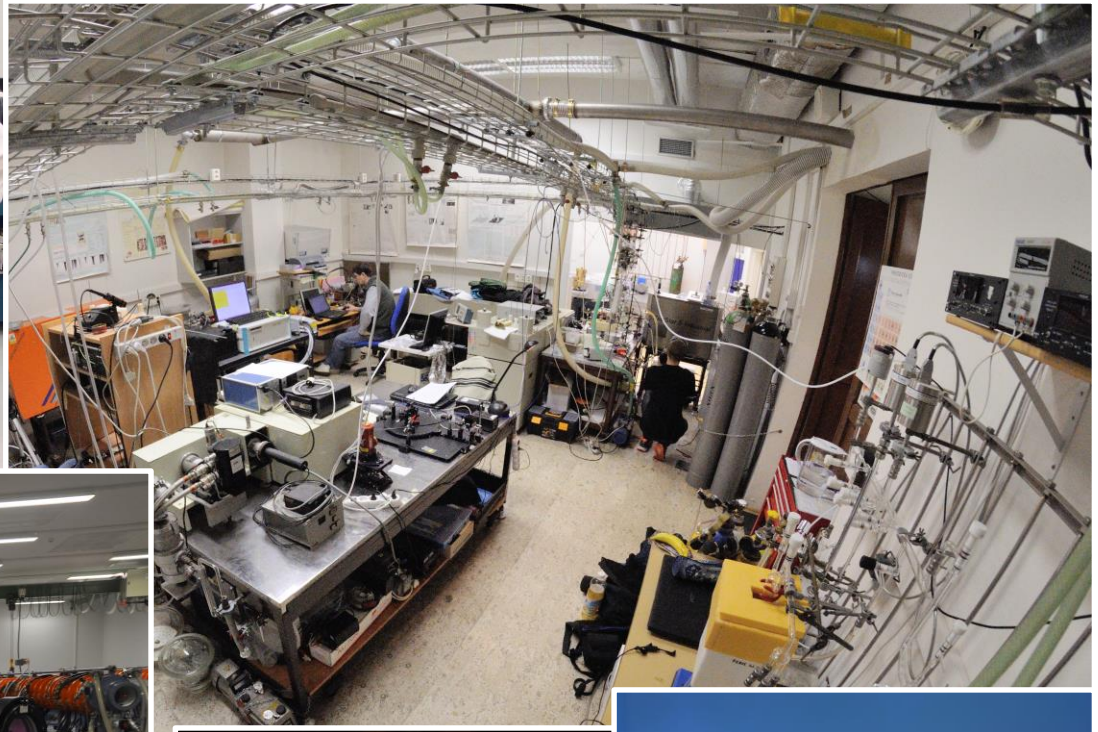


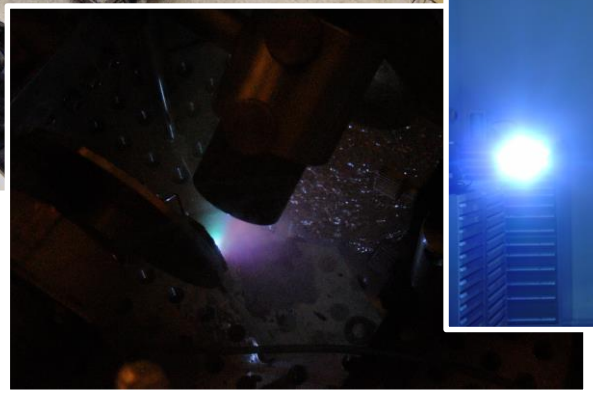


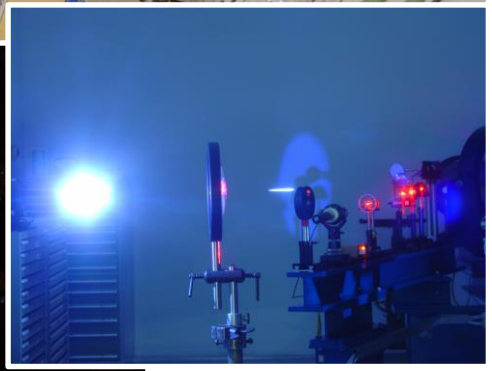


LASER PLASMA LABORATORIES: REGULAR LIBS AND TERAWATT-CLASS LASERS

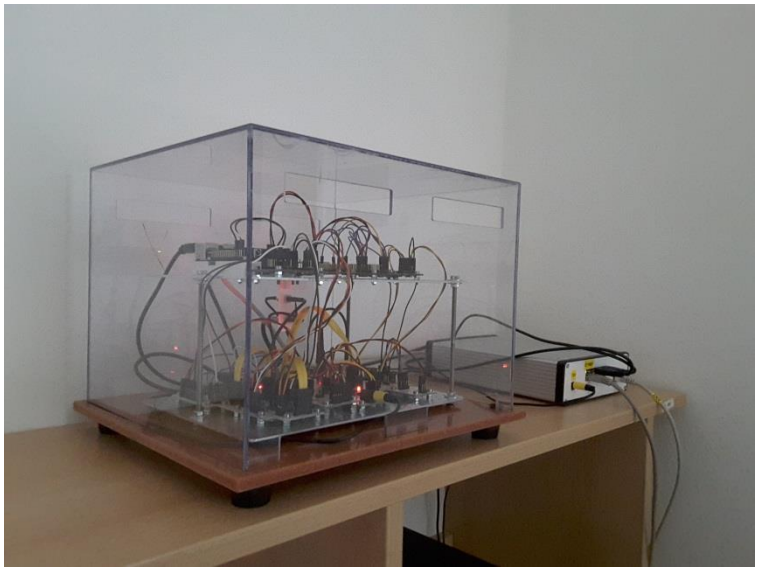




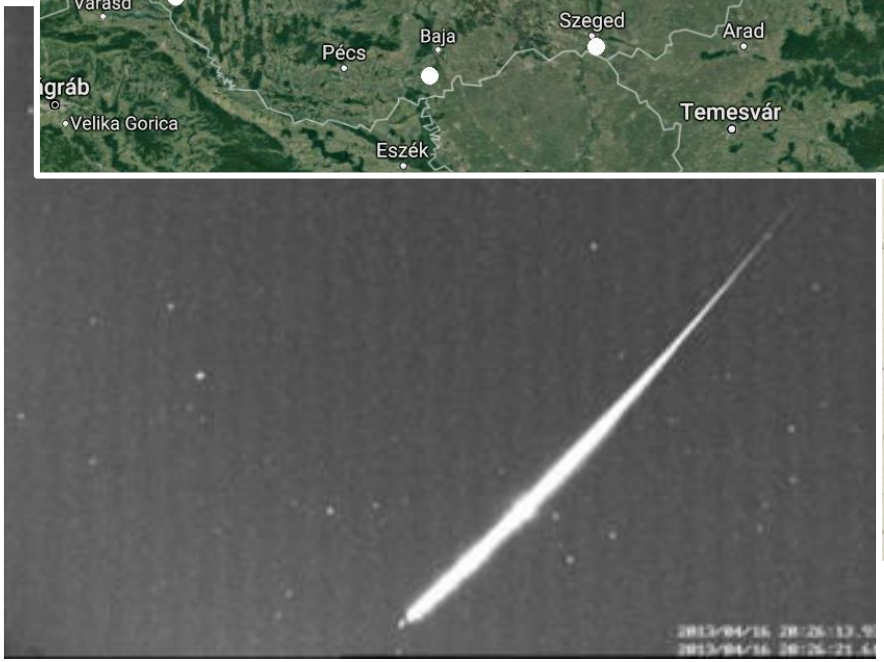


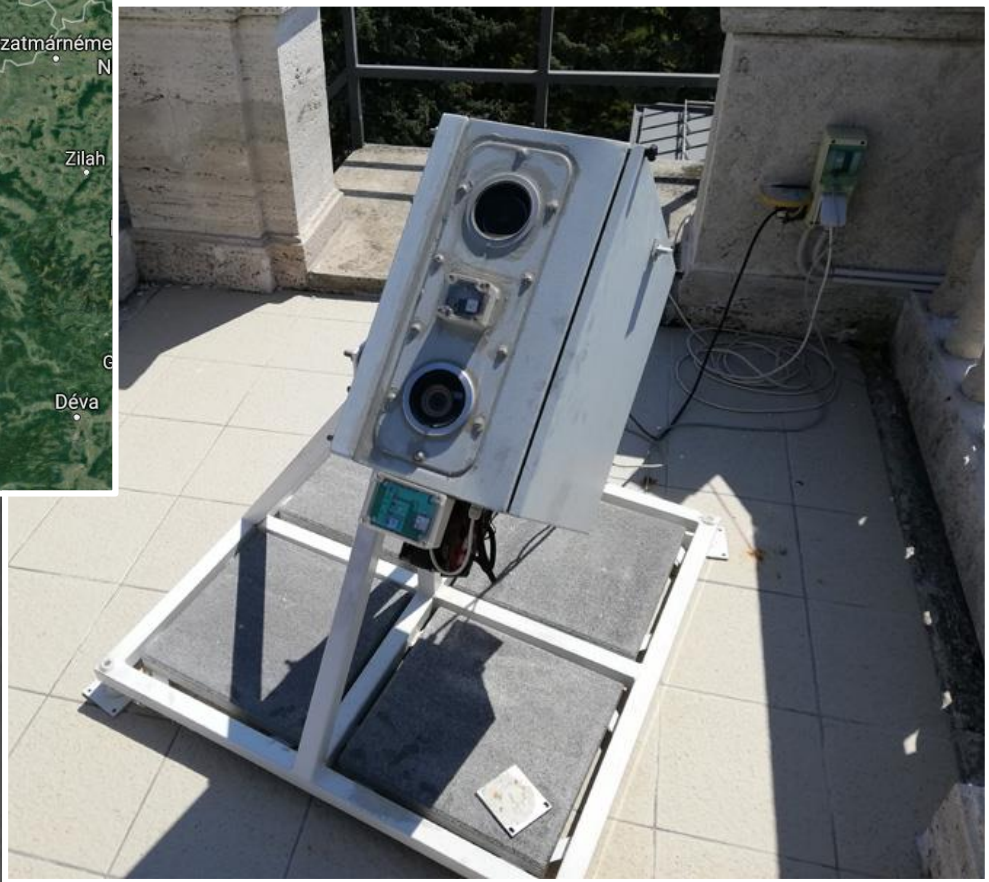


VALASSKE MEZIRICI OBSERVATORY: VIDEO, SPECTRA, RADAR AND SID MONITORING OBSERVATION



HUNGARIAN METEOR CAMERA FACILITES





SUGGESTIONS

Connect meteorite data with meteor data:

- use existing information on meteorite composition
- support information exchange (cloud database?)
- a software under preparation for trajectories and estimation of elemental composition from spectra (MeteorMaster)
- reserach on dynamics of meteors
- correlate composition and orbit (statistics)
- cooperation on related topics (evolution of the solar system, origin of life, astrochemistry).

EXAMPLE SPECIFIC IDEAS TO GUIDE COLLABORATION

- correlate observed fireball element ratios with meteorite composition for main (Fe/Mg/Na) or specific elements (like Cr)
- iron meteorites are stronger with higher Fe/Na ratio than stony meteorites → could this be connected to ablation („iron" asteroid vs. non „iron fireballs„ from showers)?
- more fragile (stony) meteoroids ablate higher → different spectra?
- light curve with terminal peak from stronger/harder meteoroids (?) → more Fe rich spectra?
- meteorite fusion crust analysis (which elements are „missing") → connect to ablation produced spectra
- search for scale of heterogenity → number of fragmentation points?

All these are ideas not more – but could **be confirmed/rejected by joint activity**.

PROJECT REALIZATION

- starting between HU-CZ-GR-RU
- focusing on meteor spectra – meteorite composition – fireball lightcurve synergy (first phase: searching for correlations…)
- yet only as a „community action”
- but potential for larger collaboration exists
- further funding is necessary

So here we (as a small group) are

- searching for collaborators
- open to involve existing projects and networks

- Please **contact us** at the meeting! (Martin Ferus, Krisztian Sarneczky, Jakub Koukal, Antal Igaz, Akos Kereszturi)

THANK YOU FOR YOUR ATTENTION!

SZÉCHENYI 2020
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