

**The 2nd UNISEC-GLOBAL MEETING
KIT, Kitakyushu, Japan
18-20 November 2014**

SPACE MINING using Nano-micro satellites

Discussion Group 3

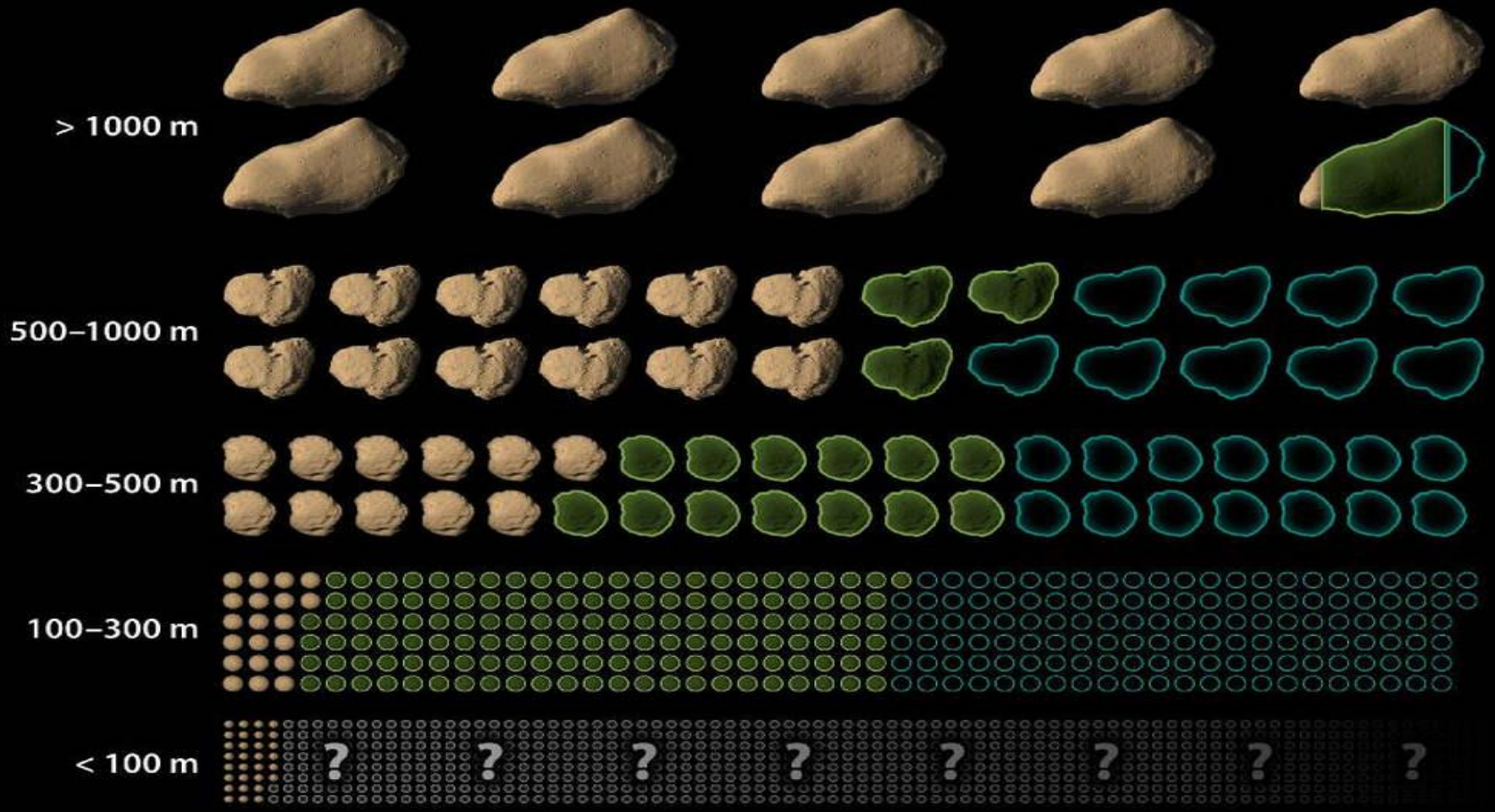
MOTIVATION

- To live in space, to send colonies to explore the space, and to maintain space vehicle with its subsystems', the main requirement is energy.
- For economic purposes the efficient way is to produce the energy/equipment needed at space instead of sending those equipment from Earth.
- Compared to the cost of having the resources in space rather than transporting from earth is much more feasible and cost efficient.

A Near-Earth Asteroid Census

Each image represents 100 objects

Known Asteroids ●
New Predicted Total (WISE) ●
Old Predicted Total (pre-WISE) ○



THE SPACE ECONOMY: A MODERN DAY GOLD RUSH

Asteroid Mining Will Create A Trillion-Dollar Industry

As our **population grows** we need to find a **sustainable supply of natural resources** to fuel exploration in space and prosperity on Earth.



MORE ASTEROIDS DISCOVERED NEAR EARTH EVERYDAY



USES OF WATER IN SPACE

-  ROCKET FUEL
-  BREATHABLE AIR
-  DRINKABLE WATER

PLATINUM-RICH ASTEROID

Could contain more Platinum Group Metals than what's been mined on Earth in all of history

NEAR-INFINITE SUPPLY OF PRECIOUS RESOURCES

WATER-RICH ASTEROID

One water-rich asteroid could produce enough fuel for every rocket launched in history.

ONE SINGLE 500M water-rich asteroid

\$5 trillion would produce over \$5 trillion worth of water for use in space.

It currently costs **\$20,000** to send a liter of water from Earth to Deep Space

USES OF PLATINUM GROUP METALS ON EARTH

REDUCE COST OF ELECTRONICS



ELECTRIFY TRANSPORTATION



DRIVE INNOVATION, AND CREATE A GREENER EARTH



ONE SINGLE 500M platinum-rich asteroid

At current market prices, one ounce of platinum is valued over **\$1,500**

Worth \$2.9 Trillion

174 times more than the yearly world output of platinum

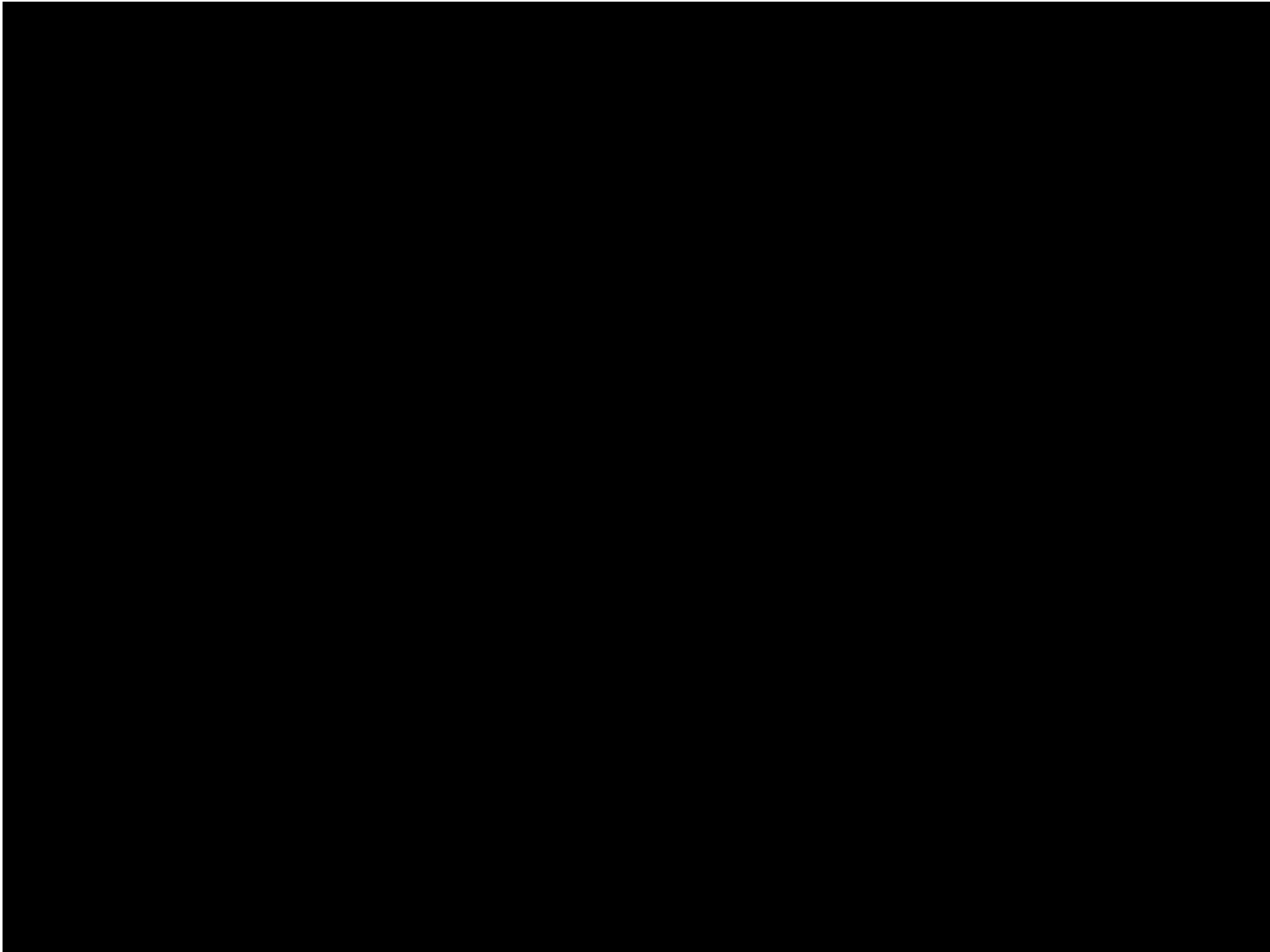
50%

More than the known world-reserves of PGMs

Asteroid mining will open a trillion-dollar industry and provide a **near-infinite supply** of Platinum Group Metals and water to **support our growth** both on this planet and off.

State of the ART

- HAYABUSHA, 2005, Japan
- ROSETTA, 2014, ESA
- Other planned projects, USA, others



SPACE MINING using Nano-micro satellites

- MAIN QUESTIONS TO DISCUSS
- What capabilities/technologies should they develop/have to space mining (power, onboard propulsion, adcs, thermal,...)
- How they can help space mining activities (can be primary or always secondary, e.g. just observation, just remote or onsite examination)