Meteors are phenomena induced by atmospheric entry of meteoroids from asteroids and comets; accordingly, the meteors give us the information in primordial objects, such as their size, orbit, population and, possibly, origin. In particular, the observation of large meteors (fireballs) leads to the understanding of Near Earth Objects (NEO) because NEO is a major source of large meteors on Earth.

Although meteors have been observed mainly from the ground so far, the ground-based observations have weak points: narrow observational range and weather dependent. These make it difficult to observe large meteors because large meteors occur less frequently. In contrast to the ground observations, a space-based observation by an earth-orbiting satellite enables a continuous global observation of meteors. Thus, we are planning to develop and launch a new CubeSat to observe large meteors from space, and aims to constrain the NEO population. Our satellite is a 3U CubeSat whose instrument is optical cameras. Launch date is planned on the early 2014.

### Near Earth Objects (NEO)

- Passing close to Earth or capable of hitting Earth
- Asteroidal or cometary origin
- Remnant of planetary embryos
- Hazard to Earth in the past and/or future
- Future resources?

**Important to understand characteristics of NEO**

### NEOs are fewer than previously thought?

Near Earth Asteroid observed by WISE (Wide-field Infrared Survey Explorer) (Mainzer et al., 2011)

- Each image represents 100 objects
- >1000 m
- 500-1000 m
- 300-500 m
- 100-300 m
- <100 m

Small NEO is a major source of large meteors on Earth

→ The observation of fireballs would lead to the understanding of small NEO.

### Space-based observations

- High-altitude observation leads to wide-range observation
- Earth-orbiting satellite enables a global observation
- Observation regardless of the weather
  → Increase of the detection of fireballs!

**Objective**

We observe fireballs using CubeSat, derive the flux of fireballs from the observations, and constrain the NEO population.

**Mission**

Observe meteoroids larger than 10cm globally and continuously
- Detect fireballs using optical cameras
- Estimate the meteoroid sizes from the optical energy of fireballs
- Constrain the orbit of meteoroid from the motion of fireball

<table>
<thead>
<tr>
<th>Size</th>
<th>3U: 10cm×10cm×30cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>4 kg</td>
</tr>
<tr>
<td>Orbit</td>
<td>Sun-synchronized orbit</td>
</tr>
<tr>
<td>Altitude</td>
<td>700-800 km</td>
</tr>
<tr>
<td>Attitude control</td>
<td>3-axes magnetic torquers</td>
</tr>
<tr>
<td>Communication</td>
<td>UHF (Up), S-band (Down)</td>
</tr>
<tr>
<td>Life time</td>
<td>1-2 yr</td>
</tr>
<tr>
<td>Scientific instrument</td>
<td>Camera</td>
</tr>
</tbody>
</table>

→ Utilize existing technology as much as possible → Speedy development

**Ground station**

Chitech has experience in satellite development.
→ Ground station is available

**Summary**

- The population of NEO smaller than 100 m is unknown.
- NEO is a major source of fireball on Earth.
- We develop a 3U CubeSat observing fireballs.
- The development process is under design stage.
- Launch date will be on the early 2014 (planned).