Open-design CubeSats for earthquake prediction and tsunami early-warning and their university-originated satellite constellation observation.

Masashi Kamogawa (Japan, UNISEC GLOBAL)
Present EQ prediction is helplessness. Earthquake (EQ) suddenly occurs for us.

Short-term prediction obviously provides disaster mitigation.

It requires precursor detection.

- 2010 Mw7.0 Haiti Earthquake
- 2004 Mw9.3 Sumatra Earthquake
- 2005 Mw7.6 Kashmir Earthquake
- 2011 Mw9.0 Tohoku Earthquake
Most large EQ occurred inside land and near ocean.

Large EQs are a major risk for human being.

Magnitude (M) > 7

100 EQs!

(USGS, 2000-2011)
French DEMETER satellite (2004-2010) statistically found promising EQ precursor.

Precursor: Electron density increase

Night time
30% detectability

4 hours

1000 km

EQ preparation

M > 5
Satellite precursor observation is useful for EQ prediction.
Methodology of EQ prediction from space

- Lightning-origin EM waves are used as a natural radar for precursor monitor.
- Dense global ground-stations provide real-time precursor monitoring.
- Satellite constellation supports globally-covered EQ monitoring.
PRELUDE: Precursory electric field observation CubeSat demonstrator

✓ CubeSat dedicated to EQ prediction
✓ Only matured technology
✓ Open-design
✓ Technology transfer
✓ Dense monitoring network from constellation
Prototype PRELUDE

Present some of components for Bread Board Model

2018 Bread Board Model

2019 Engineer-ring Model

2020 Flight Model

Launch 2021
Our scheme

Phase A
- Piggyback
- 3-yr
- Ground station

Phase B
- Piggyback
- 3-yr

Phase C
- $5M \times 4$
- 3-yr
- $10M$

Final goal:
- 70% success prediction rate
- 70% decrease of victims
Why don’t you join space EQ prediction project?