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

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Present EQ prediction is helplessness. Earthquake (EQ) suddenly occurs for us.

Short-term prediction obviously provides disaster mitigation.

It requires precursor detection.
Most large EQ occurred inside land and near ocean.

(USGS, 2000-2011)

Large EQs are a major risk for human being.

Magnitude (M) >7
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

- **Precursor:** Electron density increase

- **Issue:** EQ would occur within 4 hours.

- **Precursor detection!**

- **Normal**

- **EQ preparation zone**

- ✓ Lightning-origin EM waves are used as a **natural radar** for precursor monitor.
- ✓ Dense global ground-stations provides **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 Engineering Model

2020 Flight Model

Launch 2021
Our scheme

Phase A
- Piggyback
- 3-yr
- Ground sta.

Phase B
- Piggyback
- 3-yr

Phase C
- $5M
- $10M
- 3-yr

Prototype System feasibility
Prediction feasibility
Practical EQ prediction

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