Submarine Cable Systems for Future Societal Needs

The JTF SMART Subsea Cable Initiative:
Science Monitoring And Reliable Telecommunications,
Climate Monitoring and Disaster Mitigation

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The scientific and societal case for the integration of environmental sensors into new submarine telecommunication cables

search: itu jtf

www.itu.int/en/ITU-T/climatechange/task-force-sc/
The basic idea

- Telecom + science
- Cable repeaters host sensors
- Potential: 20,000 repeaters, 1 Gm, 50 km, 10-20 year refresh cycle
- Basic measurements: bottom pressure, temperature and acceleration;

Cable Networks:
Currently deaf, dumb and blind

...the next generations can be ocean aware
Add sensors

Source: TE subcom
Facilitation by ITU-WMO-UNESCO IOC’s Joint Task Force (JTF)

JTF, and its three sponsoring agencies, will promote, collaborate and facilitate in:

- **Helping advocate for and phased implementation of SMART subsea cable systems**
- **Linking key stakeholders:** monitoring and disasters, ocean observing community, with international and national agencies/NGOs responsible for social and economic benefits, cable owners and suppliers
- **Wet Demonstrator project:** working with observatories, industry and sponsors
- **Community involvement:** workshops (a la NASA, GFZ-JTF)

Your participation welcome and encouraged!
Recent JTF Activity

• Two NASA workshops
  – From space to the deep seafloor: Using SMART subsea cables in the ocean observing system
  – CalTech 9-10 October 2014 and University of Hawaii 26-28 May 2015

• SMART Cables for Earthquake and Tsunami Science and Early Warning:
  – GFZ Potsdam, Germany, 3-4 November 2016
  [https://eos.org/meeting-reports/commercial-underwater-cable-systems-could-reduce-disaster-impact](https://eos.org/meeting-reports/commercial-underwater-cable-systems-could-reduce-disaster-impact)

• Suboptic 2016, Dubai. JTF Workshop with cable industry, ICPC
DART Buoy Coverage

- Red – not available
- Yellow – operational
- Expensive to maintain!
Circles: Potential Epicenters of Tsunami Generating Earthquakes 120 km spacing

Color – time elapsed between an earthquake at the circle location and until the tsunami is detected at three bottom pressure sensors.
Tsunami Detection Time at three bottom pressure recorders (2016)

Color – time elapsed between an earthquake at the circle location and until the tsunami is detected at three bottom pressure sensors

Circles: Potential Epicenters of Tsunami Generating Earthquakes

120 km spacing

500 km spacing

Add SMART

Courtesy
Dr. N. Becker
PTWC

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Tsunami Detection Time at 1, 2 & 3 BPRs (2016)

1 Station  
% trench axis sources

2016 BPRs  
med = 1.1 hrs

2 Stations  
% trench axis sources

2016 BPRs  
med = 1.5 hrs

3 Stations  
% trench axis sources

2016 BPRs  
med = 2.1 hrs

% trench axis sources

2016 BPRs + cables  
med = 1.0 hrs

2016 BPRs + cables  
med = 1.2 hrs

2016 BPRs + cables  
med = 1.6 hrs

0 1 2 3 4
hours

30 minute better

Courtesy Dr. N. Becker
PTWC
JTF Wet Demonstrator – proof of concept

Demo:
• Mechanical deployment
• Science, good data

• Minimum of three repeater/sensor sets
• Minimum separation 3x water depth
• Greater separation preferred, up to 50km
Two options:
1) Purpose built demonstrator, on an existing observatory ($$$)
2) Demonstrator built by industry on a “short” telecom cable between two countries:
   • Encourage countries to engage cable operators/owners early on to consider the SMART cable option
   • Encourage cable system providers to propose a wet demonstrator option, and quantify the additional cost.
   • JTF will assist in identifying funding sources for the additional cost.
Challenges for the JTF, research community, and industry

- Raise awareness, educate and publicize (in part why we are here today)
- Search out the funds and potential investors
- Coordinate and collaborate for a universal solution, but tailored to specific deployments
- Educate governments to facilitate permits and funding, and to utilize new environmental data
- Link to other global initiatives and international agencies