



Institute for Resilient Communities

and (some) related activities in Applied Nuclear Physics

Kai Vetter

Applied Nuclear Physics, LBNL

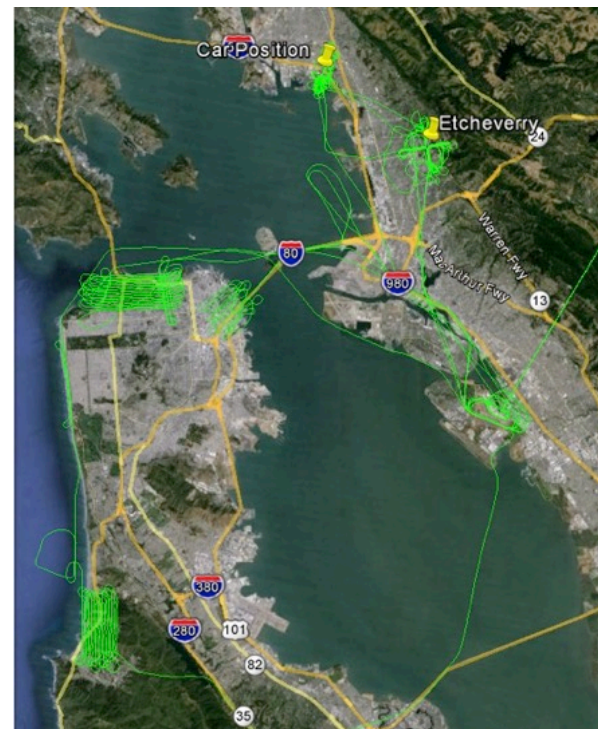
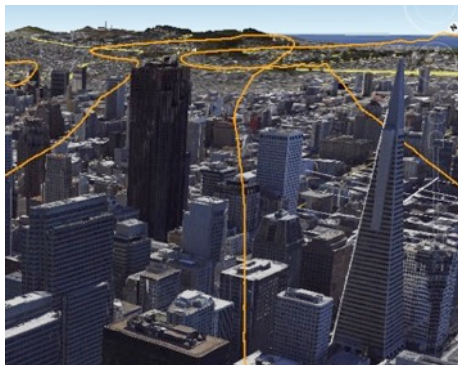
Department of Nuclear Engineering, UC Berkeley

- Introduction
- Why Resilience at Berkeley Lab?
- Specific initial resiliency activities
 - Combining science, education, and communities in a multi-disciplinary, multi-national, and multi-cultural context

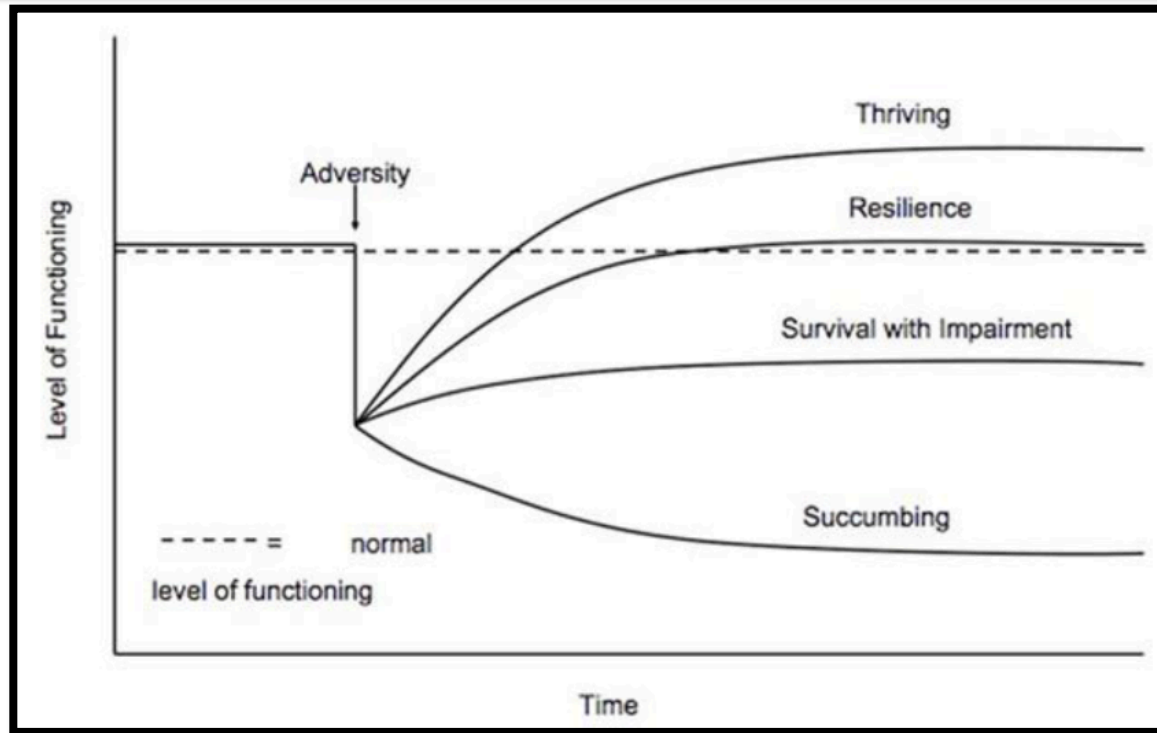
Aerial Detection Program



- We are involved in the development of new and improved radiation detection technologies for applications ranging from fundamental sciences to biomedical imaging and national security.
- A recent example of our research is the demonstration of a new detection system mounted on an aerial/ helicopter platform with two purposes:
 - Demonstrate advanced detection and localization capabilities;
 - Obtain “background” data – enhance ability to differentiate between “background” radiation and a potential threat source;
 - The Bay Area provides relevant and complex terrain, geology, and diverse urban developments enabling the evaluation across a broad range of environments;
- 8 successful flights out of Oakland over 4 days;
- Complements data sets from several other cities;



What is Resilience?



re·sil·ience

/rɪˈzɪl jəns, -ˈzɪl i əns/

IPA

Syllables

Examples

Word Origin

noun

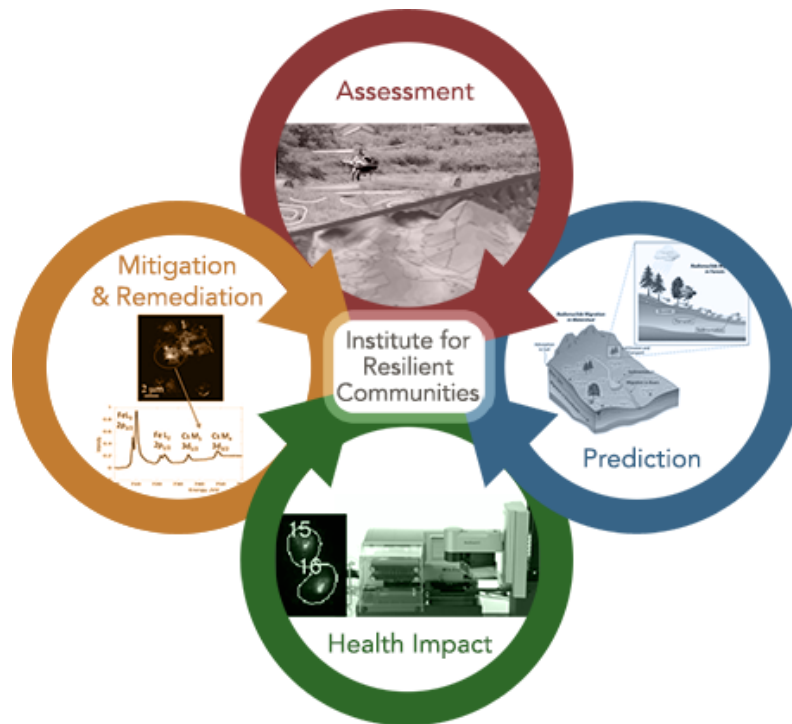
1. the power or ability to return to the original form, position, etc., after being bent, compressed, or stretched; elasticity.
2. ability to recover readily from illness, depression, adversity, or the like; buoyancy.

- Resilience means the ability to recover quickly from disruption;
- Enhanced resilience allows to reduce the impact of an accident;
- In the communication with the public – which is an essential part in achieving increased resilience – resilience is provocative as it implies that something will happen in the future;
- More science and enhanced technologies are needed to minimize the risk for accidents to happen and to reduce the impact!

Why LBNL?

The scientific domains of resilience

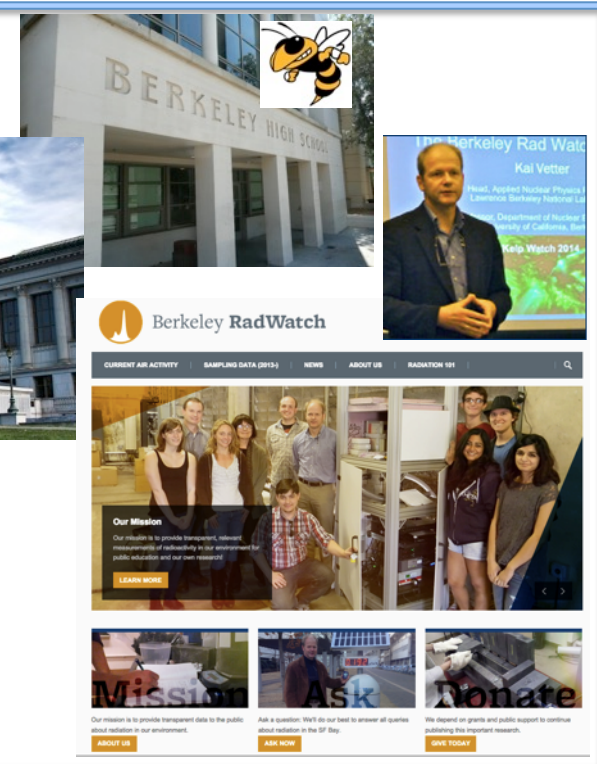
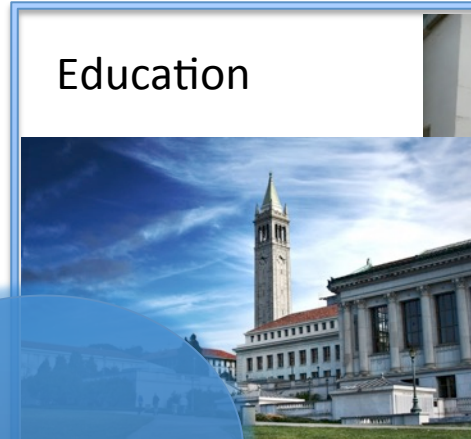
- More science and enhanced technologies are needed to minimize the impact of accidents or events that are associated with catastrophic consequences!
- Enhanced capabilities to assess, predict, estimate impact, and mitigate!



- LBNL provides unique science and technology capabilities
 - + Education (UC Berkeley, Lawrence Hall of Science (?), Bay Area high schools, ...)
 - + Communities (Berkeley, Oakland, SF, Koriyama, Fukushima, ...)

Enhancing Resilience

Integrating Science, Education, and Communities



Resilience

Areas of Resilience

➤ Sudden changes

- Tsunami & Flooding
 - Health & Epidemics
 - Accidents
 - Biol., chem., rad.
 - Cyber security
 - ...
- } “Old”
- } “New”



➤ Long-term changes

- Energy
- Climate change
- ...



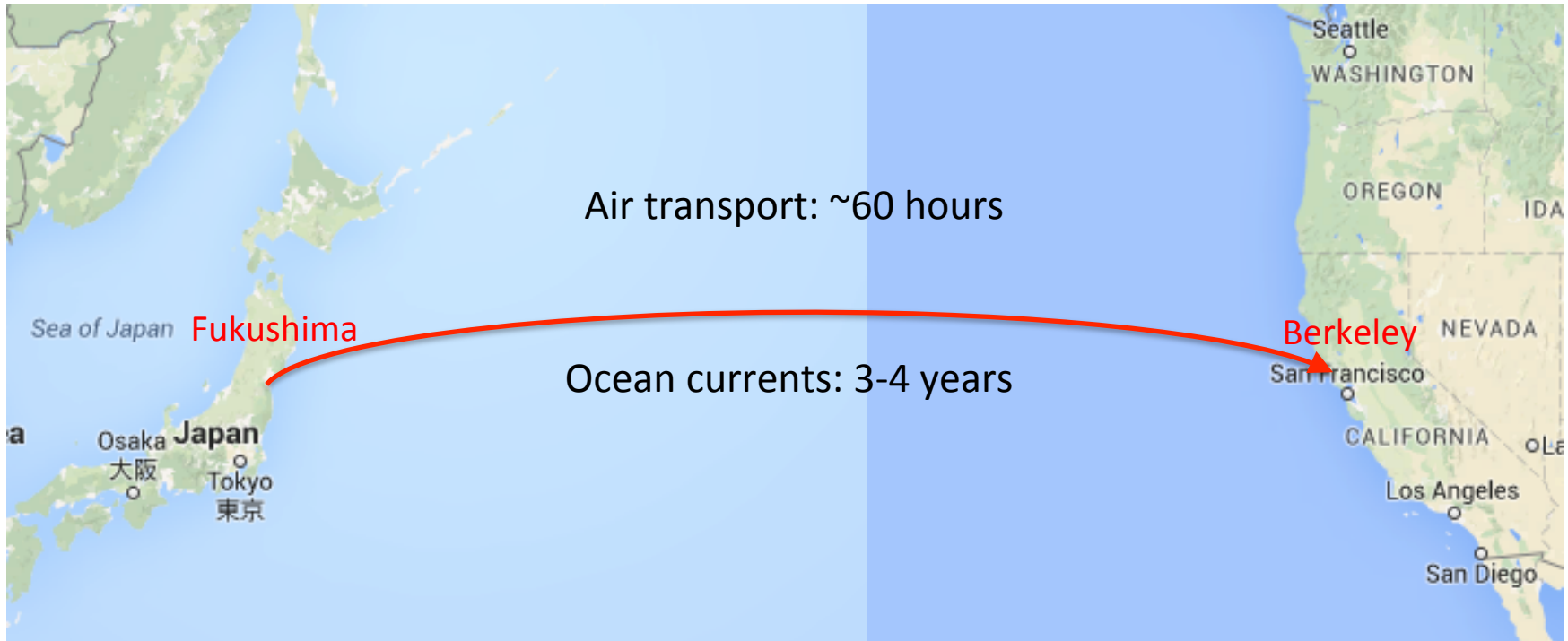
Specific Example

Explosion at Dai-ichi Nuclear Power Plant (Fukushima) – March 15, 2011



Transport of radioactive materials

World without borders!



- Challenges: Local event with global impact (e.g. Ebola or Fukushima)
 - Transport
 - Public and social media

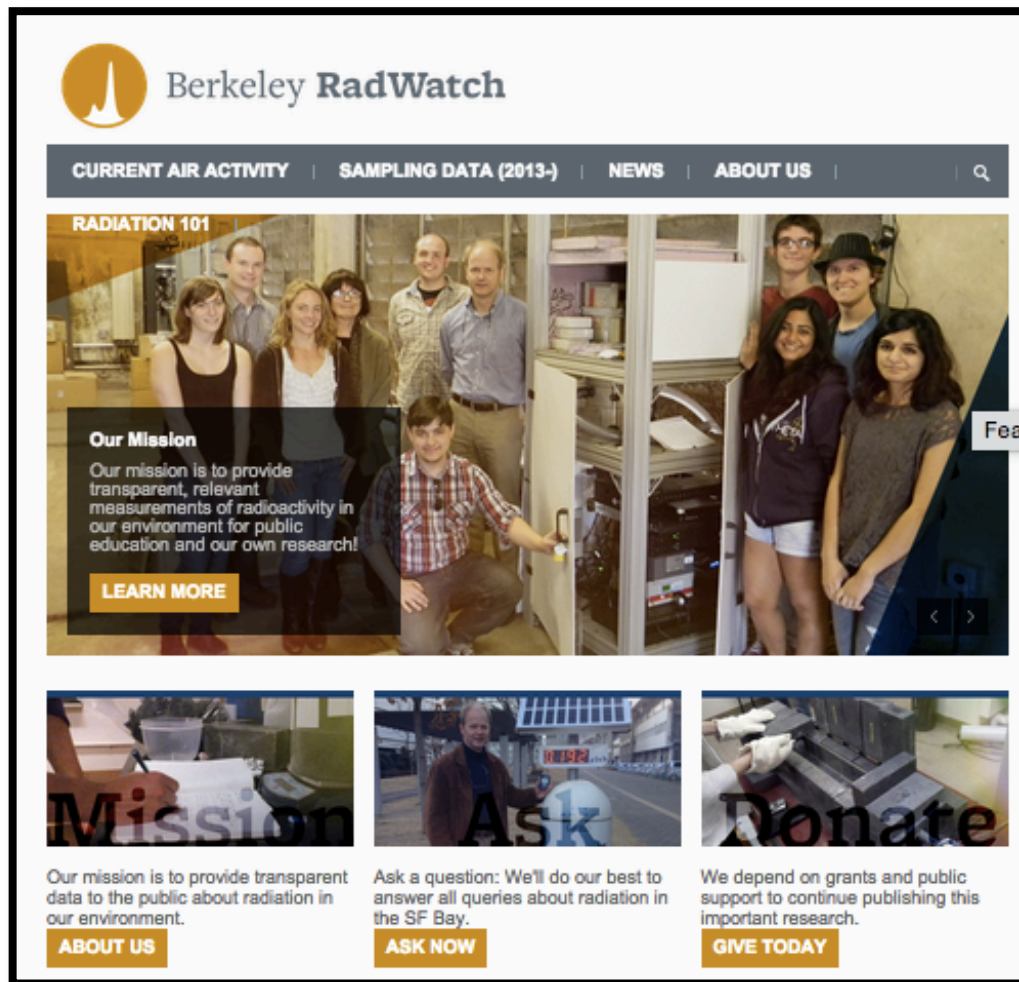
Concerns in California

- Understandable concerns after Fukushima accident (including my wife ...)
 - Can we go outside? Even in rain, even without an umbrella?
 - Can children play outside?
 - Do we need to leave California?
 - Can we drink water or milk? Do we need filters?
 - Do we need to take iodine pills (sold out in CA)?
 - Can we use a Geiger counter?
 - What do the numbers and units mean – cpm vs dose (rem vs. Sievert) and dose rate (rem/hour vs. (milli or micro) Sievert/hour or Sievert/year), etc.
 - ...
- Government
 - Why is our government not doing more? Is it censoring data?
 - Can we trust it?

Our response: Berkeley RadWatch

- Perform independent **measurements** in Berkeley using sophisticated instruments available in our UC Berkeley radiation detection labs;
- Make data available in an easy-to-understand format to the media and public within one hour;
- Put data and results in context!
 - Compare with natural and elective radiation levels in the U.S.; For example, cross-country flight in U.S.;
- Engage public and media as trusted scientific partner in **dialogue**;
- Integrate science, outreach, and communities;

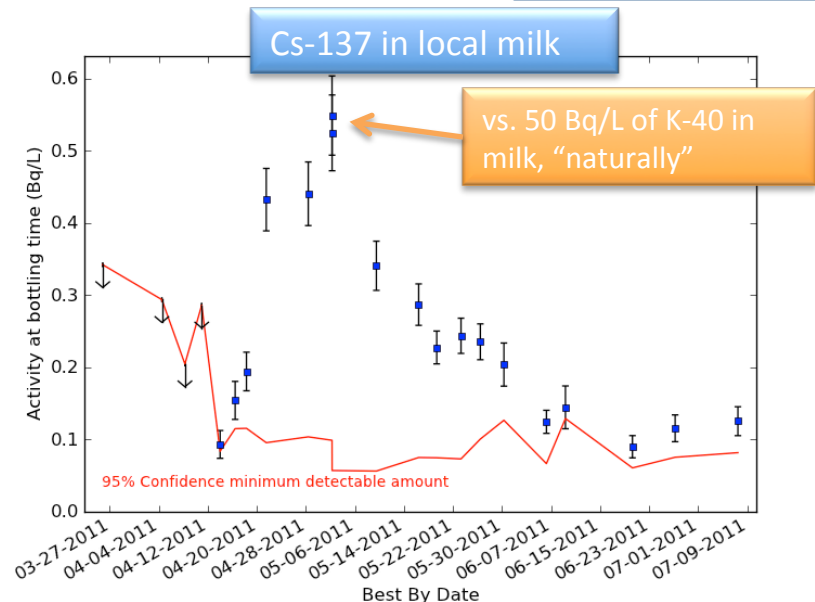
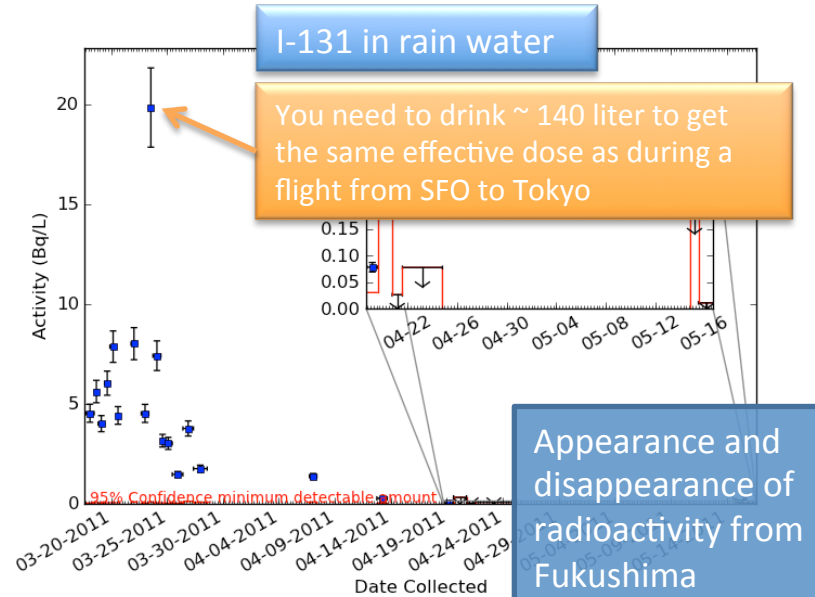
<http://radwatch.berkeley.edu>



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- Seaweed measurements for Indian Tribes from NorCal

First “small-scale” demonstration of enhancing resilience!



Measure, publish, and explain ...

Berkeley RadWatch

search this site

Navigation

- Latest News
- About RadWatch
- RadWatch Data
- BRAWM Data (2011-2013)
- KelpWatch
- Frequently Asked Questions / Ask A Question
- Contact
- Who We Are
- Trending
- Donate!

New RadWatch Website!

Submitted by CRAM on Fri, 01/24/2014 - 11:55

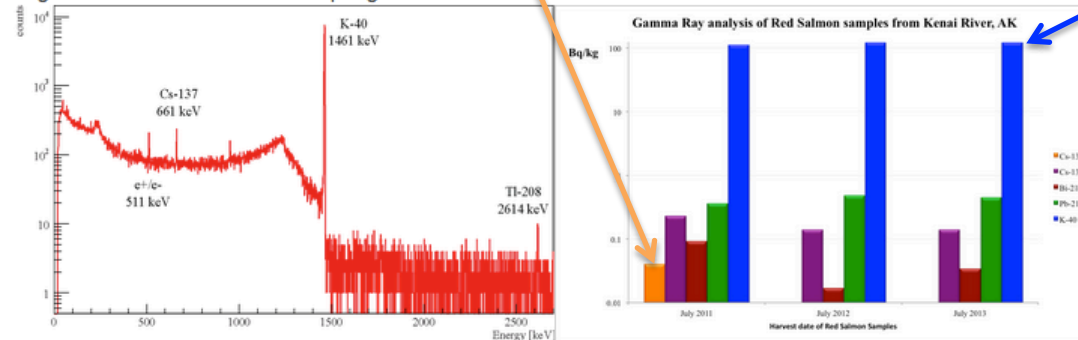
Formerly [BRAWM](#), we have updated our website to become [RadWatch](#). Read more about our previous activities and ongoing measurements!

[Read more](#)

Results of Red Salmon from Alaska caught in 2011, 2012, and 2013

Submitted by kjthomas on Thu, 01/30/2014 - 14:34

Three Fukushima related observed once in 2011 (0.02Bq/kg) the location (the Kenai River) in July for each of the last three years-- 2011, 2012, 2013! A small amount of Fukushima-sourced radio-cesium was found in the July 2011 sample, likely from the initial airborne releases of radioactivity in Spring of 2011. No Fukushima-related radioisotopes were found in the 2012 or 2013 samples. Naturally radioactive potassium dominated the gamma spectrum. Bi-214 and Pb-210 are also natural products of the decay chain of Uranium-238, which originates from releases before Spring 2011.



[Read more](#)

<http://radwatch.berkeley.edu> + <http://kelpwatch.berkeley.edu>

Measure, publish, and explain ...

Dec 24, 2013:

- A YouTube video is going viral on measuring radioactivity at a Half-Moon Bay beach!

YouTube

92

Fukushima radiation hits San Francisco (Dec 2013) CONFIRMED

KillYourTV

Subscribe 6,610

821,873

2,239 496

Published on Dec 24, 2013

This shocking video was taken December 23rd 2013 with a quality Geiger Counter south of Pacifica State Beach (Surfers Beach) California. Regular background radiation reading is 30 CPM. Near the ocean background is 150 CPM. The fine mist coming from the ocean waves and/or the constant accumulation of radioactive particles in the sand seems to be what makes the Geiger Counter jump up 5X. This is not normal at

Measure, publish, and explain ...

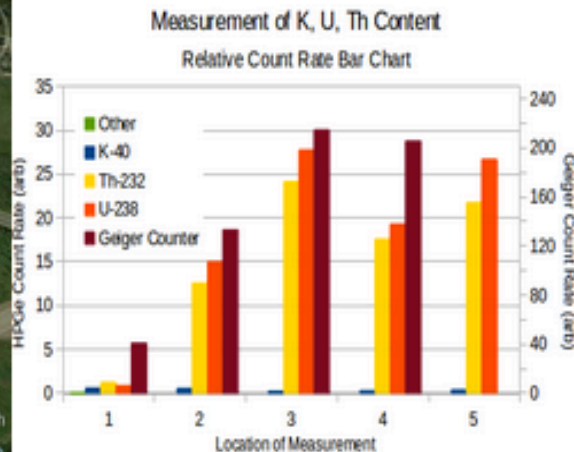
Our response:

- Take our state-of-the-art gamma-ray spectrometer and perform independent measurement
- Explain variations by naturally occurring radioisotopes reflecting geological composition of sand;
- No indication of Fukushima-related radioactivity;

Half Moon Bay Measurements

Submitted by rp on Thu, 01/23/2014 - 13:39

Surfer's beach near Half Moon Bay has been in the news a lot in the past several weeks over a youtube video featuring a Geiger counter making measurements there and decided that it would be good to share this information with the public. Read on to see our results!



Variation in Geiger counter consistent with variations in naturally occurring Th-232 and U-238 radionuclides!

<http://radwatch.berkeley.edu> + <http://kelpwatch.berkeley.edu>

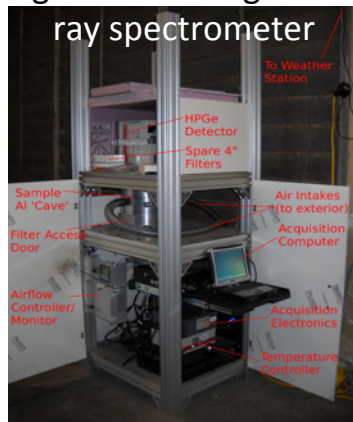
Latest Addition: High-Sensitivity, Real-Time Air Monitor

- Continuous and real-time air monitoring station
 - Sophisticated (and expensive!) gamma-ray spectrometer installed on roof of our building in Berkeley
 - Hourly updates on a wide range of radio-isotopes in local air

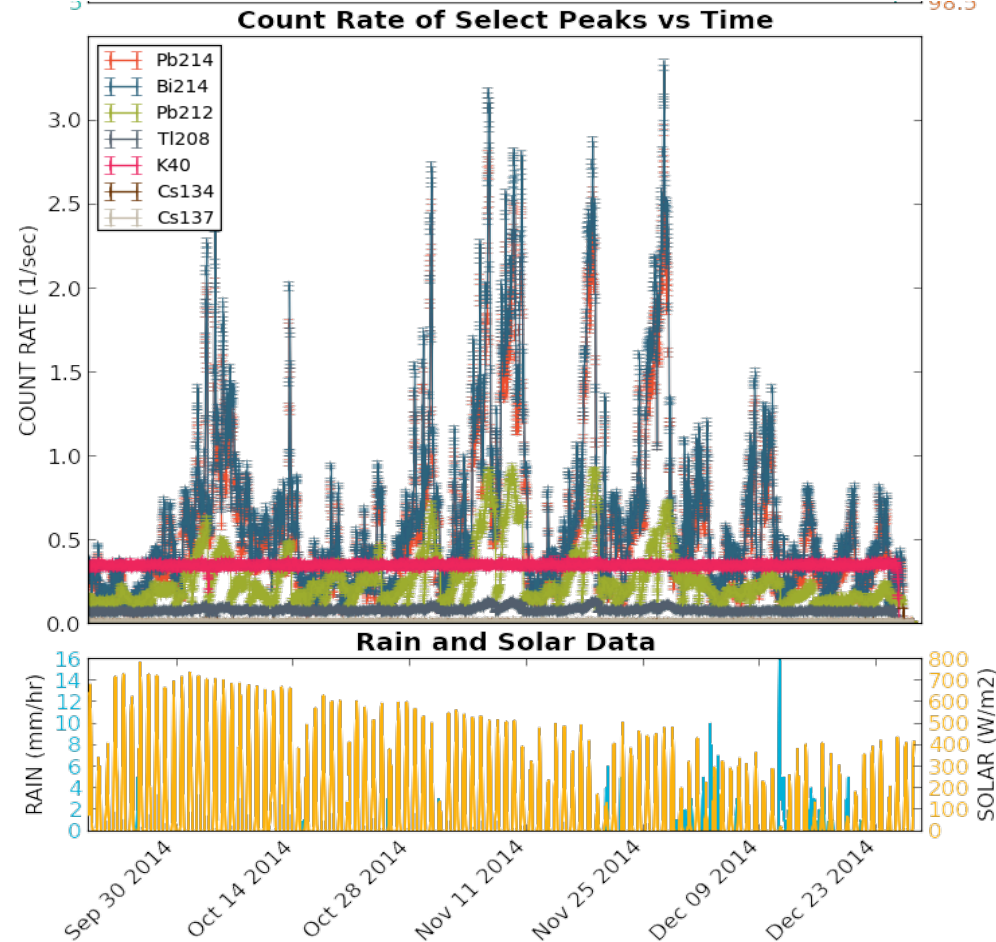
Weather station



High-resolution gamma-ray spectrometer



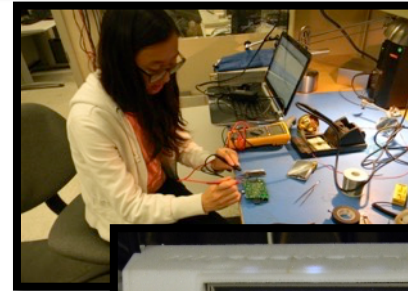
Background radiation !



<http://radwatch.berkeley.edu> + <http://kelpwatch.berkeley.edu>

Berkeley DoseNet

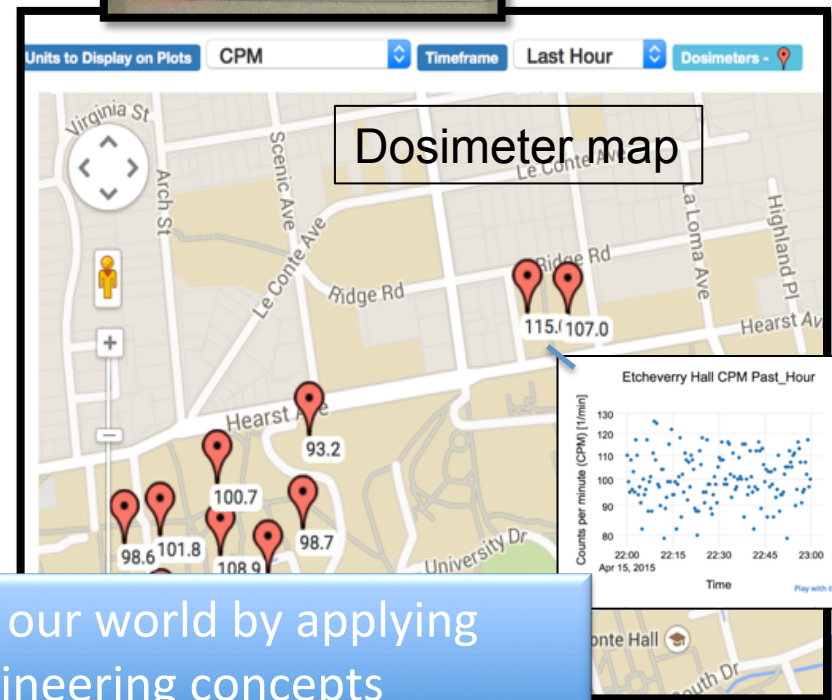
- Establish dosimeter network at and with Californian schools
- Build, program, and deploy dosimeters
- Use data from network and Berkeley Radwatch to perform scientific analysis, reporting, and presentations (e.g. live or via webcast)
- Based on dosimeter network, establish “social” network of schools and us
- Use network as backbone for other sensors and data:
 - Meteorological data, air pollution, CO₂, UV radiation, ...
- Expand beyond California, for example, Fukushima



Students can build dosimeter

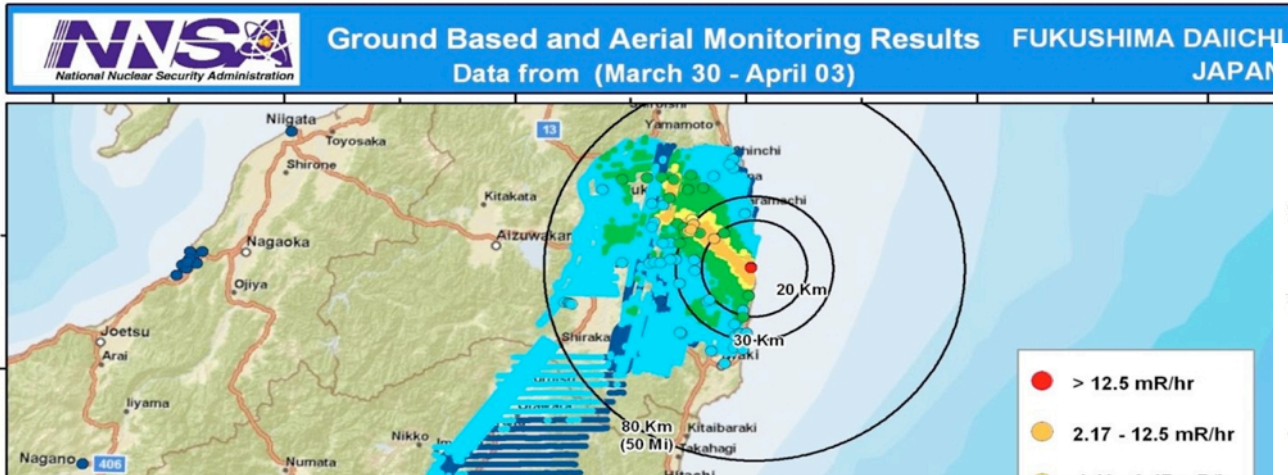


Fully operational and networkable dosimeter with programmable units (w/ touch screen)

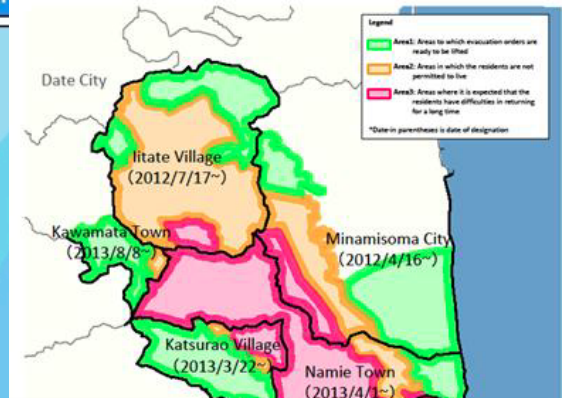


“See” and learn what is normal in our world by applying fundamental science and engineering concepts

4+ years later: >70,000 Evacuees remain



Evacuated Areas



Main (and significant) health impact:

- Psychological stress – Uncertainty due to lack of information and knowledge, e.g. fear of radiation – Change in lifestyle, lack of exercise:
 - >1500 deaths are attributed to evacuation and changing lifestyle!
- Very likely that no death can be attributed to radiation (according to international organizations with independent experts such as WHO, IAEA, and UNSCEAR)
- Remaining challenge: Return to normal life!
 - How will contamination change over time?
 - What is impact of low-dose exposure?

Berkeley Lab is part of the solution...

Challenges

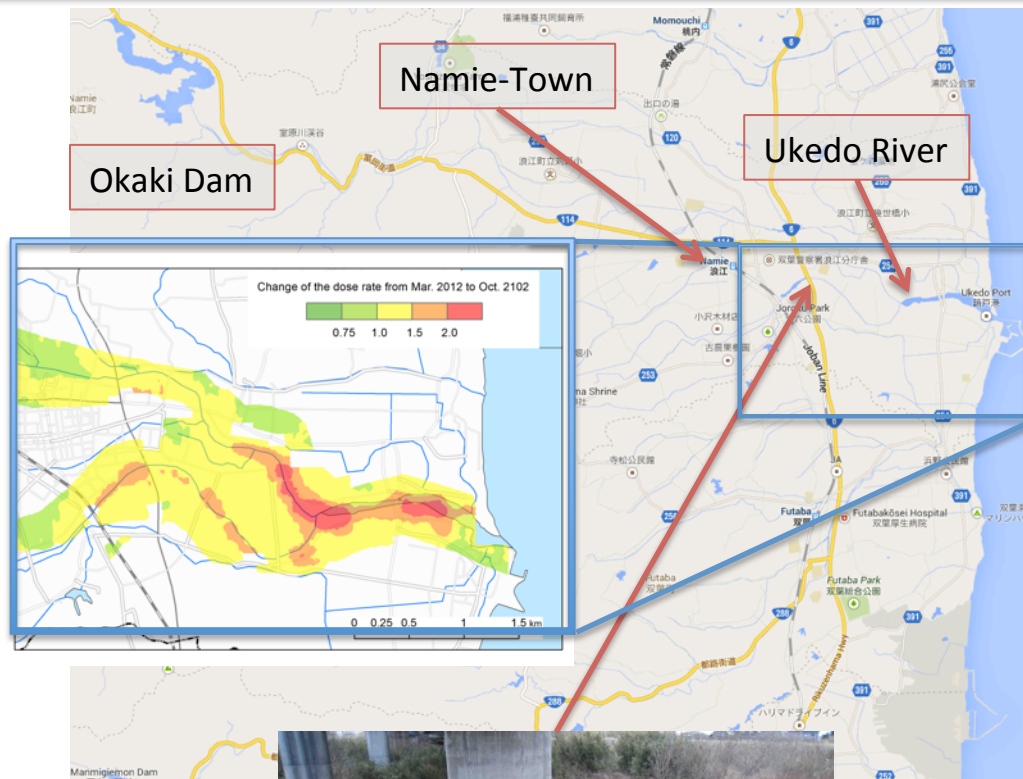
- How will contamination change over time?
- What is impact of low-dose exposure?
- Return to normal life ASAP!

Opportunities

- LBNL has unique capabilities and expertise in all key areas.
- LBNL is a respected, independent, and trusted scientific resource.

Approach

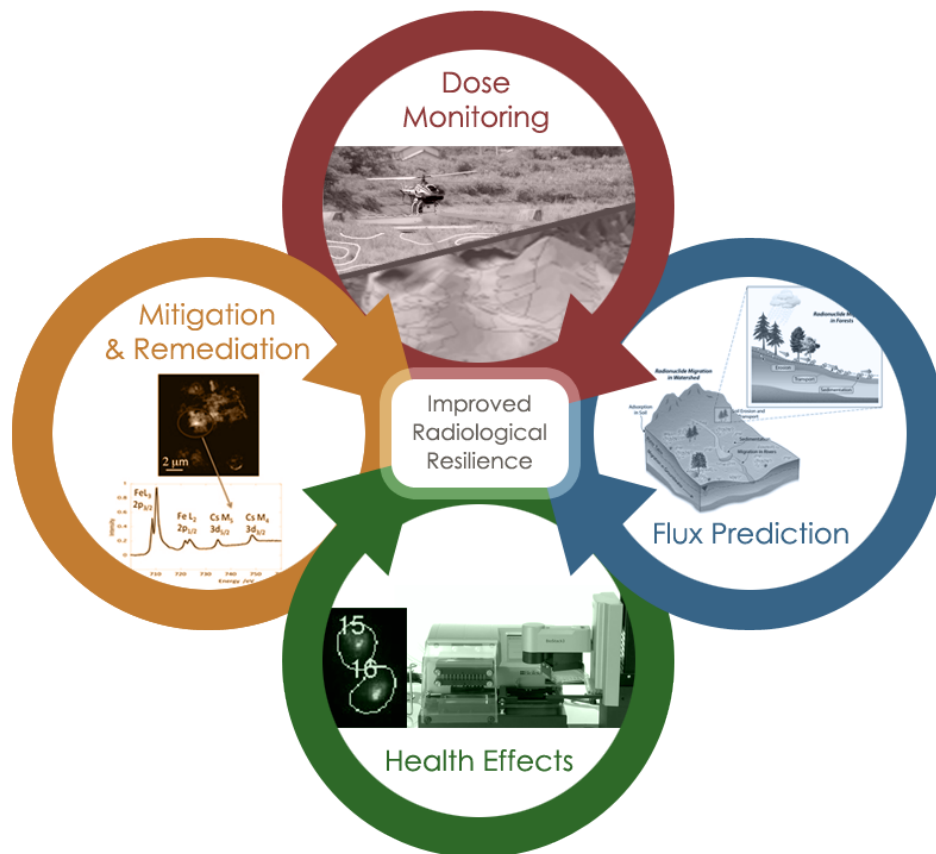
- While focusing on one area in Fukushima and its specific challenges, we are establishing a scientific framework and the capabilities for Fukushima and beyond.



LBNL scientists at Ukedo River, March 10, 2014

Scientific Domains to Enhance Radiological Resilience

Enhance understanding of the underlying mechanisms of the environmental transport of radioisotopes from dispersion to uptake into the biosphere, their impact on humans, and to provide effective means of mitigation for increased radiological resilience



➤ LBNL has world-leading and recognized expertise and capabilities in all key areas.

Integrate communities, educational & research institutions



Univ.
Tokyo



Institute for
Resilient
Communities



Koriyama City



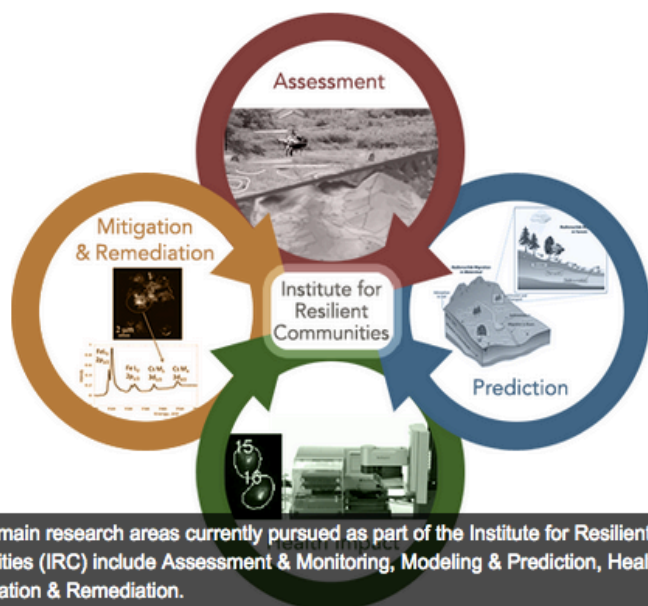
... in a multi-disciplinary, multi-international, and multi-cultural framework.



Institute for Resilient Communities

Enabling resilience through science, technology, education and outreach

Home Science Education Events News People Partners Contact Resources



News

WWII Aircraft Carrier Bomb Tests Found

A team from the National Atmospheric Administration found the wreck of the 623-foot American light aircraft carrier USS Intrepid (LST-1169) off the coast of Japan.

Lab Hosts International Resiliency Conference

What does it take to build a radiologically resilient community? The heart of the International Symposium on Radiological Resilience & Beyond was held at the Lawrence Berkeley National Laboratory (Berkeley, California, USA) on Friday, April 10th, 2015.

International Safety

The international safety was held in California, USA. The theme of this conference was 'Building Resilience through Science, Technology, Education and Outreach'.



INTERNATIONAL SYMPOSIUM ON RADIOLOGICAL RESILIENCE & BEYOND

Lawrence Berkeley National Laboratory, Bldg 50 Auditorium, April 10th, 2015

Menu

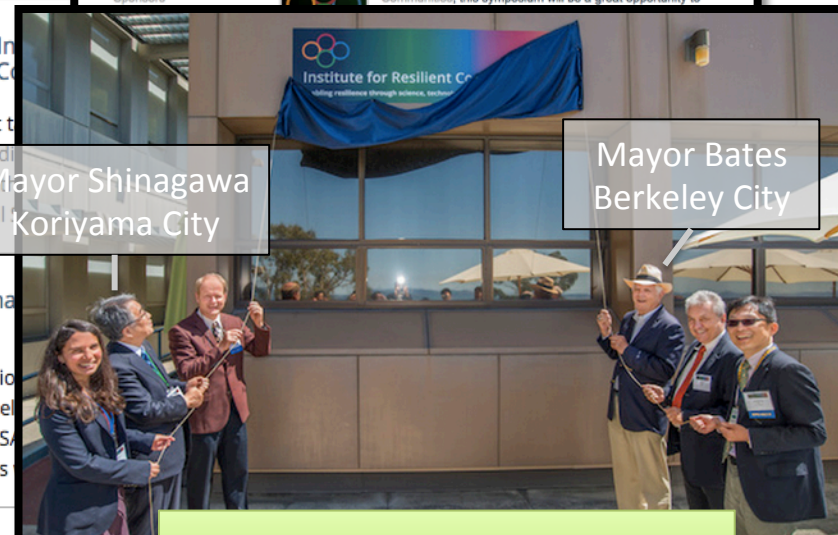
Welcome
Program
Venue and Travel
Registration
Sponsors

Welcome

We are pleased to invite you to the inaugural International Symposium on Radiological Resilience and Beyond. This symposium will be held at Lawrence Berkeley National Laboratory (Berkeley, California, USA) on Friday, April 10th, 2015.



Concurrent with the opening of the Institute for Resilient Communities, this symposium will be a great opportunity to



Mayor Shinagawa
Koriyama City

Mayor Bates
Berkeley City

Next symposium in April
2016 in Koriyama City

<http://irc-berkeley.org>

Thank you for your attention!

