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CTBT On-Site Inspections

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Disclaimer

CTBT On-Site Inspections

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Abstract. On-site inspection (OSI) is a critical part of the verification regime for the Comprehensive Test-Ban Treaty (CTBT). The OSI verification regime provides for international inspectors to make a suite of measurements and observations on site at the location of an event of interest. The other critical component of the verification regime is the International Monitoring System (IMS) which is a globally-distributed network of monitoring stations. The IMS along with technical monitoring data from CTBT member countries, as appropriate, will be used to trigger an OSI. After the decision is made to carry out an OSI, it is important for the inspectors to deploy to the field site rapidly to be able to detect short-lived phenomena such as the aftershocks that may be observable after an underground nuclear explosion. The inspectors will be on site from weeks to months and will be working with many tens of the tons of equipment. Parts of the OSI regime will be tested in a field exercise in the country of Jordan late in 2014. The build-up of the OSI regime has been proceeding steadily since the CTBT was signed in 1976 and is on track to becoming a deterrent to someone considering conducting a nuclear explosion in violation of the Treaty.

The Comprehensive Nuclear Test-Ban Treaty provides for On-Site Inspection…

Treaty, Article 4, paragraph 34

> Each State Party has the right to request an on-site inspection in accordance with the provisions of this Article and Part II of the Protocol in the territory or in any other place under the jurisdiction or control of any State Party, or in any area beyond the jurisdiction or control of any State.

So, How would you go about doing this?

Within a 1000 km^2 area with 40 people in 60 days with a possible extension of 70 days

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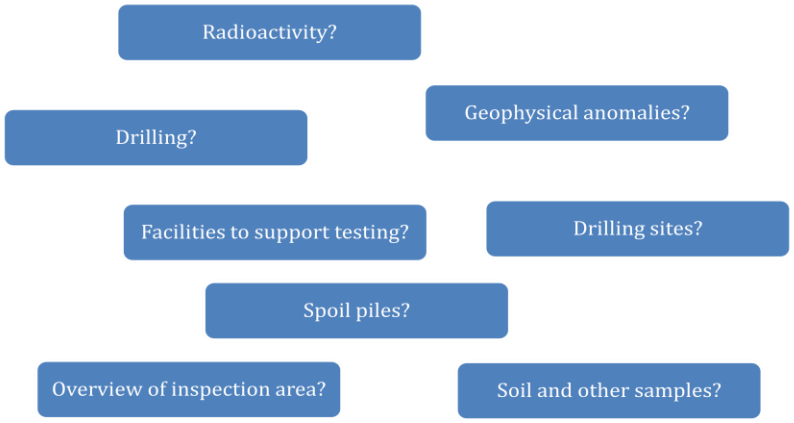
Does the inspection site look like this?

DOE Nevada photo gallery

Or this?

Source: Las Positas College website

What would one look for? What measurements would you take?



The CTBT provides for certain measurements and activities

The following inspection activities may be conducted and techniques used, in accordance with the provisions on managed access, on collection, handling and analysis of samples, and on overflights:

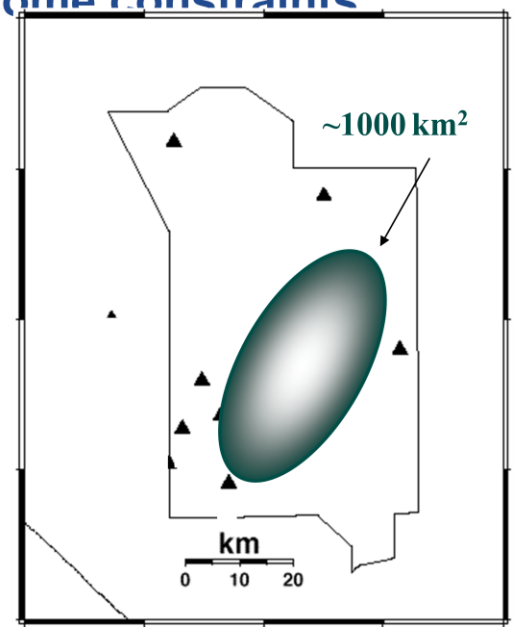
(a) Position finding
(b) Visual observation, video and still photography, and multi-spectral imaging
(a) Measurement of levels of radioactivity
(d) Environmental sampling
(e) Passive seismological monitoring for aftershocks
(f) Resonance seismometry and active seismic surveys
(g) Magnetic and gravitational field mapping, ground penetrating radar and electrical conductivity measurements at the surface and from the air
(h) Drilling to obtain radioactive samples

Protocol, Part III, paragraph 69

What all needs to be done?

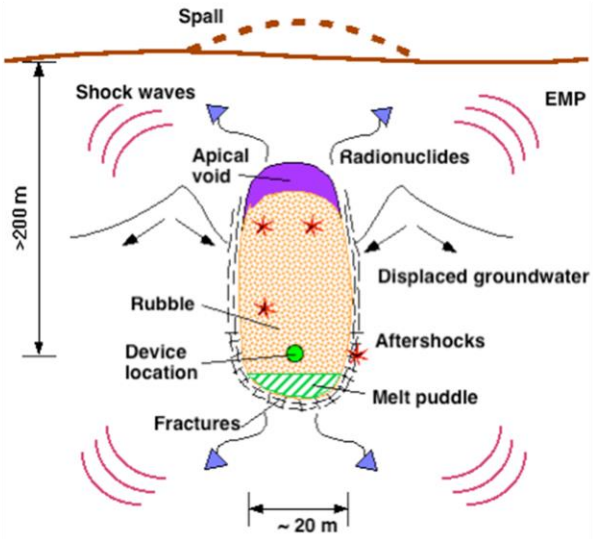
- Get the inspection approved ✓
- Mobilize the inspectors ✓
- Pack up the equipment ✓
- Get inspectors and equipment to the inspection site ✓
- Set up base camp ✓
- Arrange with host State for services ✓
- Carry out inspection ✓
- Decide when to quit looking ✓
- Prepare a factual report of findings ✓

The inspection area can be up to 1000 km² with some constraints



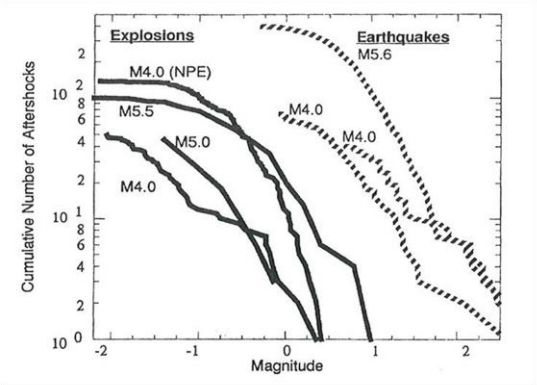
Size of the inspection area compared against the Nevada National Security Site (former Nevada Test site

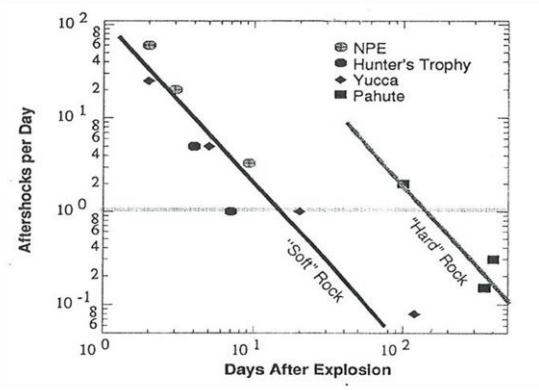
First off, what are you looking for?



Schematic of underground nuclear explosion phenomenology

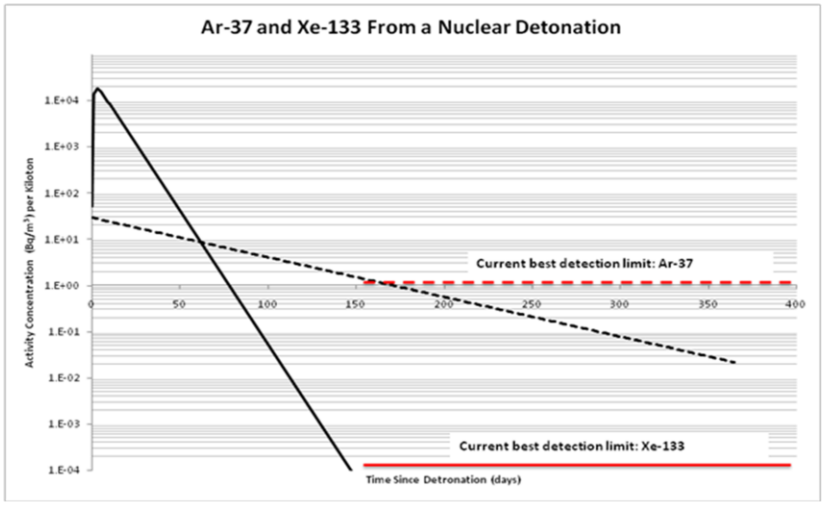
Aftershocks are a critical driver for getting into the field quickly





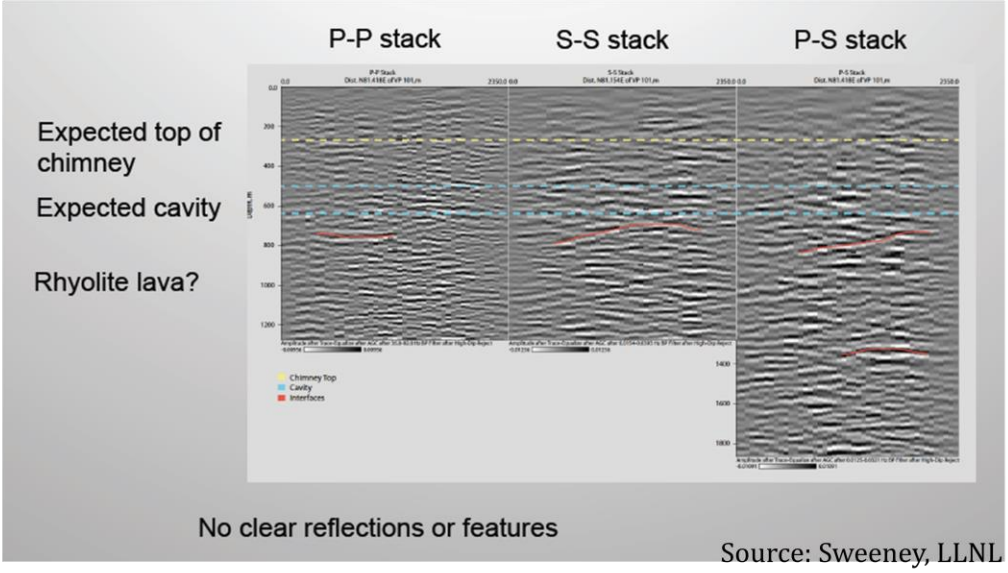
After receipt of request ~7days to get to inspection site

Radionuclide signatures persist somewhat longer



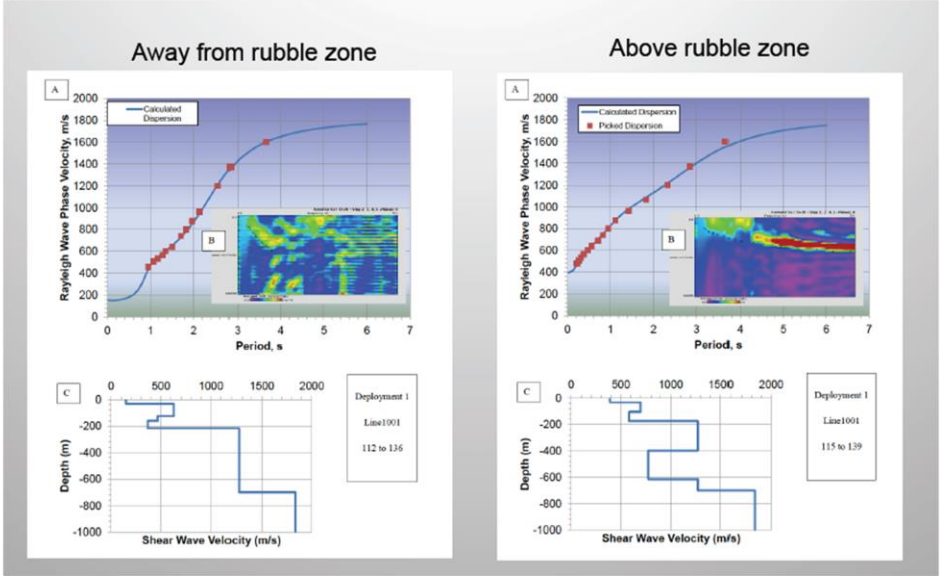
Source: T. Bowyer, PNNL

Using geophysics to look for the cavity. Example over previous test using seismic reflection



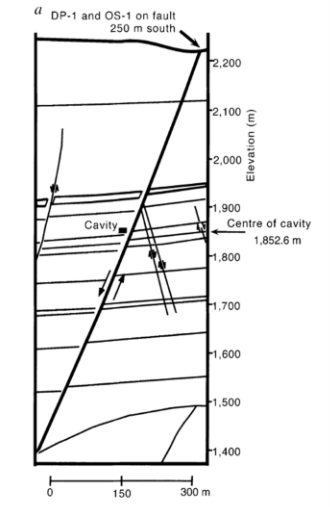
Source: Sweeney, LLNL

Example of passive seismic over same previous test



Source: Sweeney, LLNL

What is the probability that noble gases will make it to the surface?



"Since 1970, 126 (US) tests have resulted in radioactive material reaching the atmosphere…" from: *The containment of underground nuclear explosions*, OTA-ISC-414, 1989

- Includes 'late time seeps' of noncondensible (e.g. noble gases)

Carrigan et al (1996) concluded that noble gases should be observable 50 to 80 days after detonation

Source: Carrigan, LLNL

OSI logistics are challenging

50 tons of equipment were shipped for the 2008 exercise

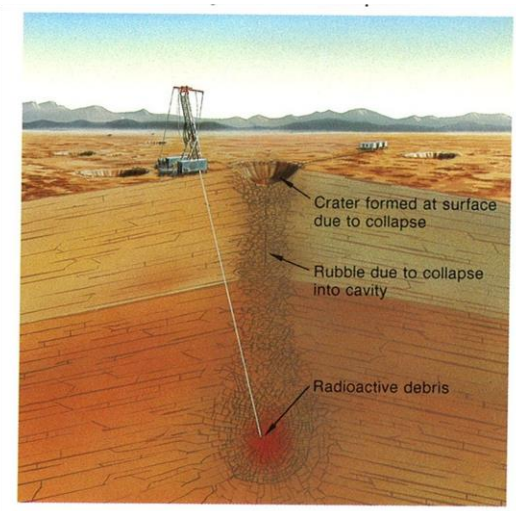
Kazak Base Camp (2008)

Unpacking equipment
Kazak Base Camp (2008)

Source: CTBTO Spectrum

Drilling can be carried out if necessary

Drilling into 'working point' was routinely carried out during the test program



Source: LLNL

OSI regime development efforts are focused on the Integrated Field Exercise

Source: www.ctbto.org/specials/integrated-field-exercise-2014/

Conclusions

- On-site inspections are likely to be challenging from all aspects: technically, logistically, etc.
- The OSI regime is on track to become an effective deterrent to someone considering conducting a nuclear test

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