

Nuclear Explosion Debris: Considerations for Verification

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Nuclear signatures may remain many years after an explosion has occurred

- Prior to, during, and following a nuclear explosion, radiation is released from the source material
- Radioactive atoms decay over time – in some cases on the order of decades, centuries, or even millennia
 - The resulting debris from a nuclear explosion contains radioactive signatures that may help characterize the event



Chernobyl accident ^{137}Cs contamination:
10 years later

This is also true for underground and partially vented nuclear explosions

- In the case of an underground explosion, it is still possible to retrieve useful information many years later
- This is also true if an underground explosion is partially vented and material is released above ground



Plume from Baneberry test – 18 December 1970

The analysis of this debris can be exploited as a verification mechanism for international treaties

- Comprehensive Test Ban Treaty (CTBT)
 - The CTBT verification regime incorporates monitoring stations and on-site inspections



CTBTO monitoring station:
Antarctica

- Fissile Material Cut-off Treaty (FMCT)
 - Discussions have acknowledged the need for robust verification techniques
 - On-site inspections are a possibility



President Barack Obama –
Prague, 5 April 2009

Training and deployment of field inspectors must be done with care

- Requiring on-site verifications means the following are necessary aspects of the inspection teams:
 - Multinational
 - Well-trained
 - Experienced
- While training is important, care should be taken not to compromise the sensitive information of any government
 - It is essential to balance the exchange of knowledge with the need to protect sensitive information
 - Is it ultimately possible to train without teaching?

Drilling for sample collection is an arduous process, but may be necessary for verification



Drillback operations to gather information from old explosion debris are possible

Nuclear explosion debris remains useful long after the initial event

- Nuclear explosions create debris
 - This debris can help characterize the explosion
 - ... even if the explosion occurred several years ago
- It may be possible to train personnel to collect old explosion debris for the purpose of treaty verification
- Nuclear treaties should be pursued and each country has an obligation to fulfill its treaty requirements
 - However, this should not come at the expense of national security or interests

Time does not wash away information that may be useful in verifying treaty compliance