

CTBT

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Outline

- Treaty fundamentals
- The ratification game
- Verification
- Future
- Discussion

Treaty fundamentals

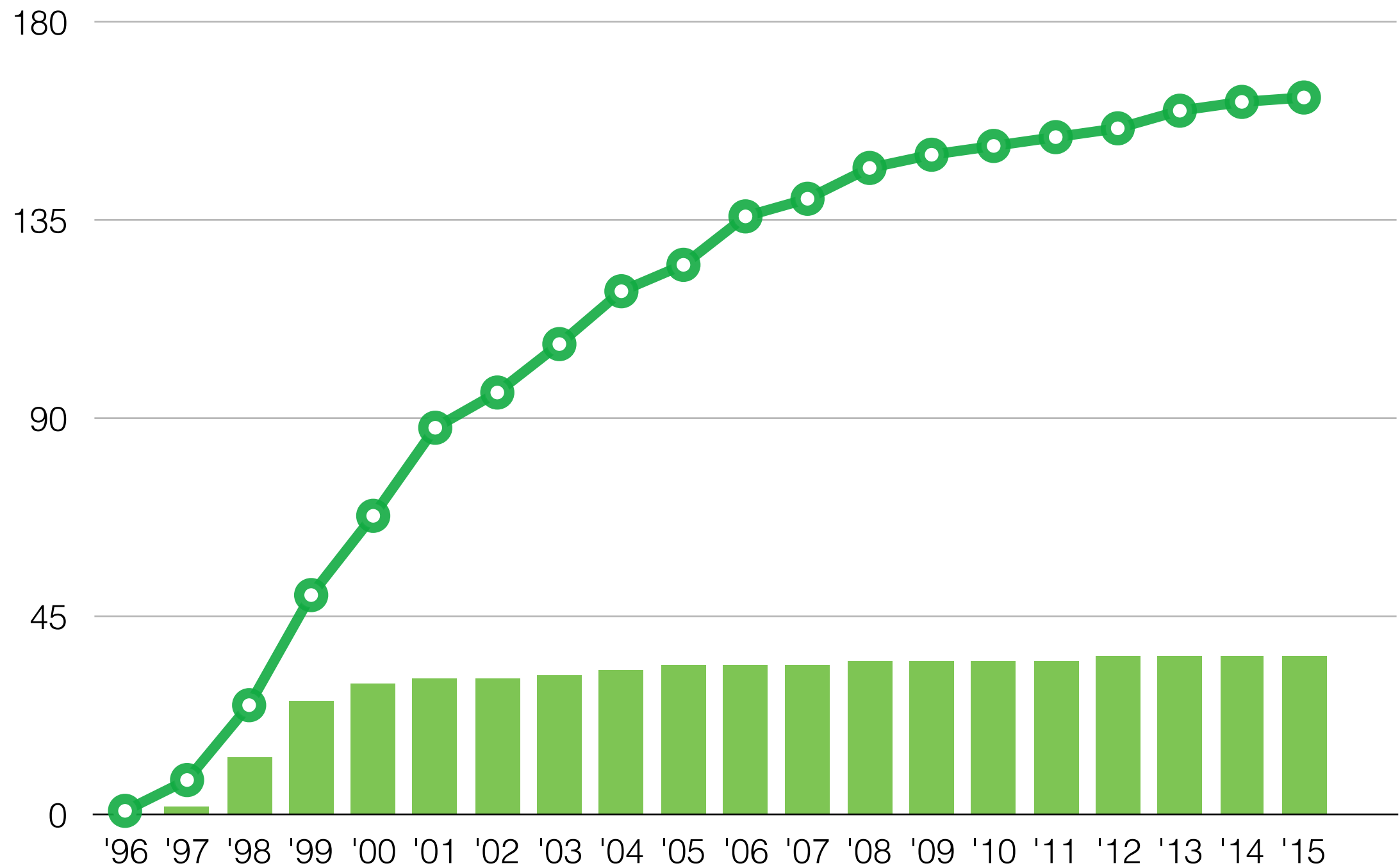
Obligations

- Article I: Basic obligations.
- Article II: The organisation.
- Article III: National Implementation Measures.
- Article IV: Verification.
- Article V: Measures to redress a situation and to ensure compliance, including sanctions.
- Article VI: Settlement of disputes.
- Article VII: Amendments.
- Article VIII: Review of the Treaty.
- Article IX: Duration and withdrawal.
- Article X: Status of the protocol and the annexes.
- Article XI - XIII: Signature; Ratification; and Accession.
- Article XIV - XVII: Entry into force; Reservations; Depositary; and Authentic Texts

Annexes and protocols

- Annex 1. List of states pursuant to article II. 28.
- Annex 2. List of states pursuant to article XIV.
- Protocol:
 - Part I. The International Monitoring System.
 - Part II. On-site Inspections.
 - Part III. Confidence Building Measures.
 - Annex 1. List of IMS stations.
 - Annex 2. Characterisation Parameters for Standard Event Screening

Members



Annex II states

Ratified (36):

Japan*
Peru*
Slovakia*
Austria*
France*
United Kingdom of Great Britain and Northern Ireland*
Australia*
Brazil*
Spain*
Germany*
Sweden*
Argentina*
Canada*
Finland*
Italy*
Netherlands*
South Africa*
Poland*
Belgium*
Hungary*
Norway*
Republic of Korea*
Bulgaria*
Switzerland*
Mexico*
Romania*
Turkey*
Bangladesh*
Russian Federation*
Chile*
Ukraine*
Algeria*
Democratic Republic of the Congo*
Viet Nam*
Colombia*
Indonesia*

Signed but not ratified (5):

China*
Egypt*
Iran (Islamic Republic of)*
Israel*
United States of America*

Not signed (3):

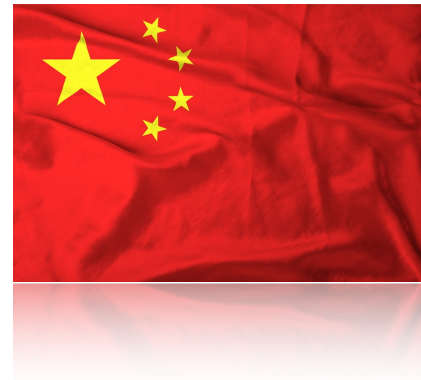
Democratic People`s Republic of Korea*
India
Pakistan

The ratification game

Nuclear weapon states

United States, first test 1945

China, first test 1962



Nuclear armed states

Israel, never tested.

India, first test 1972

Pakistan, first test 1998

D.P.R.K, first test 2006

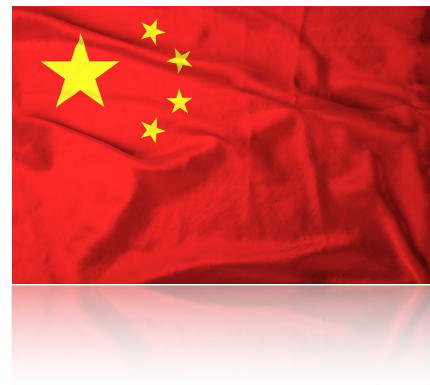


Non-nuclear weapon states

Egypt

Iran





Ok. Me too.



I'll ratify



We're allies.
Whatever.

China. We're mates.
Count me in.



With Egypt
on this.

Israel... NPT.

Well, if
Pakistan and
China...



LOL. Nope.



Verification

Article I

- “Each State Party undertakes not to carry out any **nuclear** weapon **test** explosion or any other nuclear **explosion**, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.”

Article I analysed

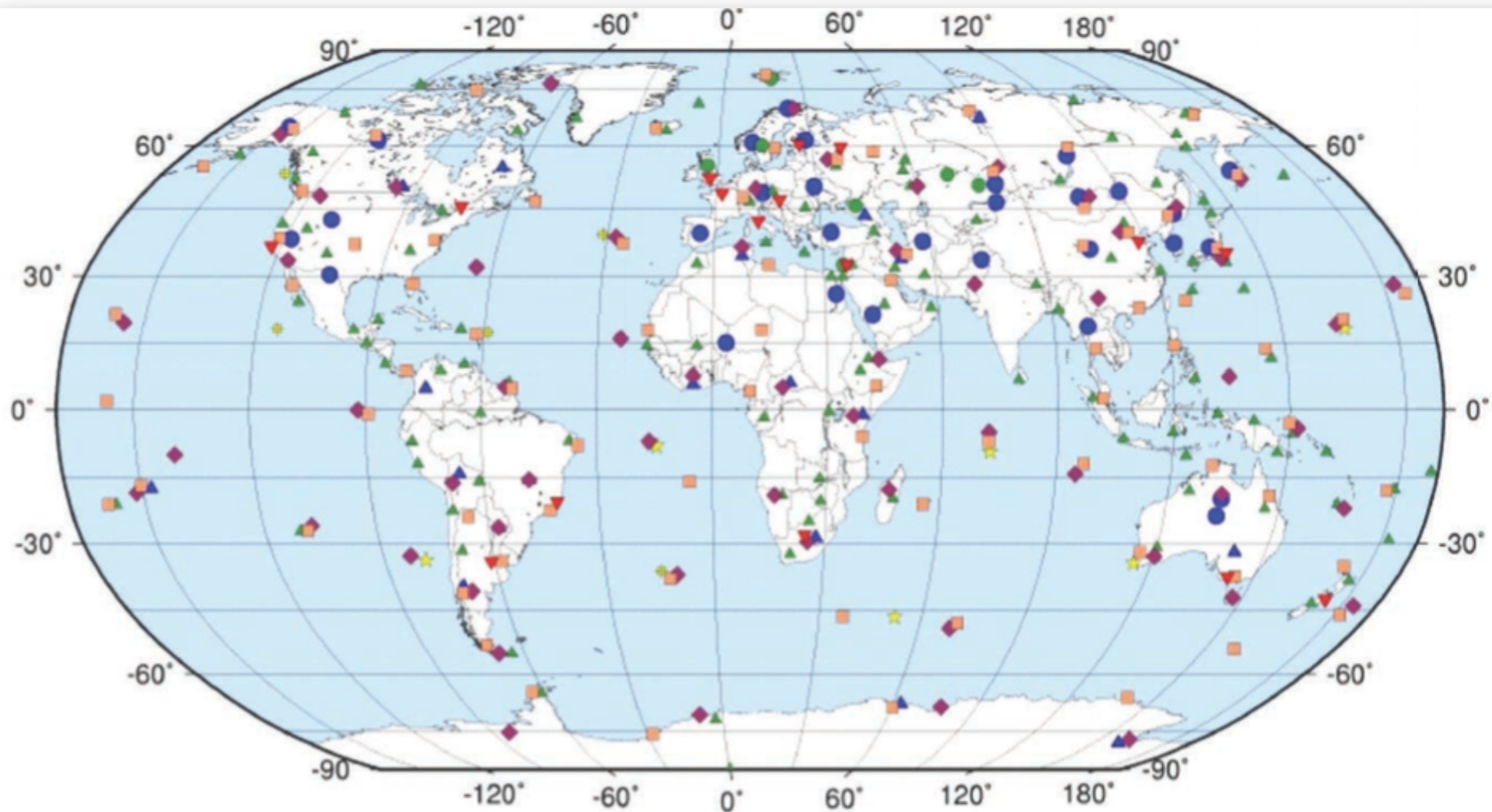
- Ordinary meaning of the terms:
 - ‘a procedure intended to establish the quality, performance, or reliability of something ...’ (a **test**); which relates
 - ‘to the nucleus of an atom’ (a **nuclear test**); which results in
 - ‘a violent expansion in which energy is transmitted outwards as a shock wave.’ (a **nuclear test explosion**).
- What is allowed?

Types of indicators

Phenomena	Monitoring environments	Propagation	Technology
Seismic waves	Underground and underwater	Through earth and water	Seismometers
Hydroacoustic waves	Atmospheric, underground, underwater and space	Through water	Hydrophones and T-phase seismic stations
Infrasound	Atmospheric	Through air	Infrasound detectors
Radionuclides	Atmospheric, underground, underwater and space	Through air, water, rock fractures, space (through electromagnetic field)	Ground based and airborne collectors
Electromagnetic pulse	Atmospheric	Through air and space	Satellites and EMP burst detectors
Optical flash	Atmospheric and space	Through air and space	Optical flash detectors
Nuclear radiation	Space	Through space	Satellites and radiation detectors

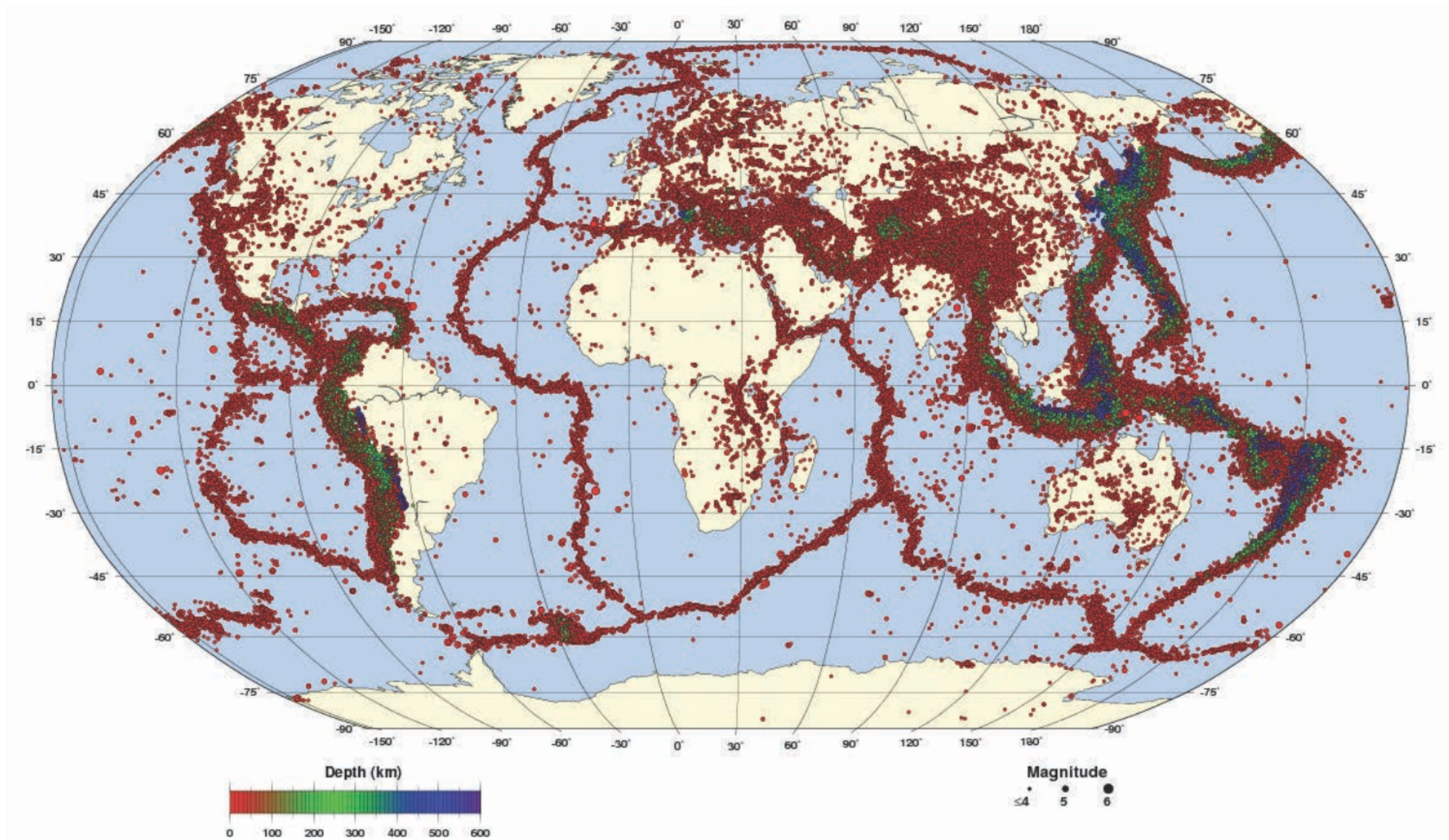
The IMS

- 337 stations.
- 170 seismic primary and auxiliary stations
- 11 hydroacoustic (hydrophone and t-phase).
- 60 infrasound.
- 80 RN stations.
- RN labs.



- | | | | |
|----------------------------------|------------------------------------|--------------------------------------|------------------------|
| ● Seismic Primary Array | ● Seismic Auxiliary Array | ★ Hydroacoustic (hydrophone) Station | ◆ Infrasound Station |
| ▲ Seismic Primary 3-comp Station | ▲ Seismic Auxiliary 3-comp Station | ◻ Hydroacoustic (T-phase) Station | ◻ Radionuclide Station |
| | | | ▼ Radionuclide Lab |

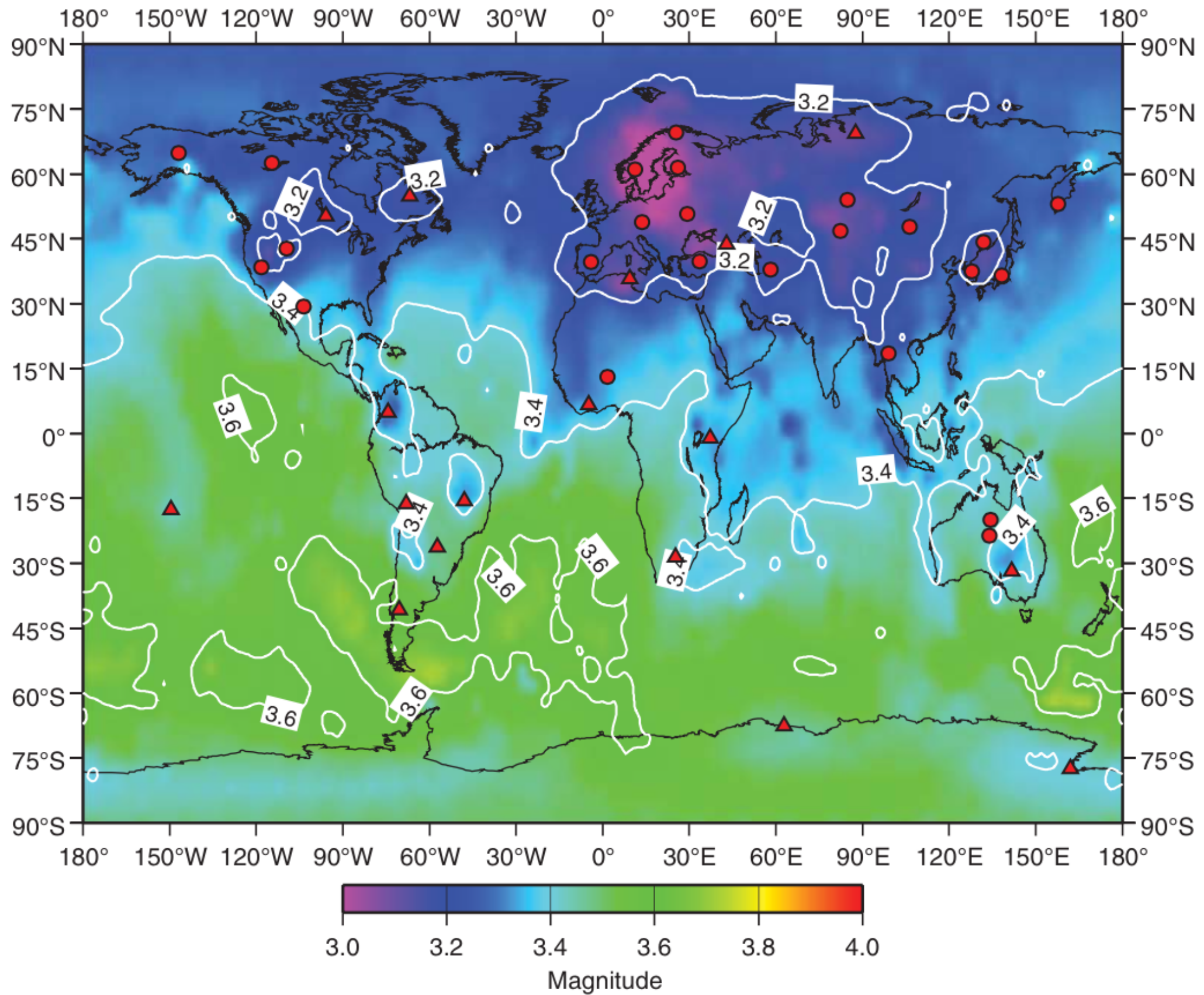
Source: CTBTO



IMS events 2000-2015

Continental detection

Source: CTBTO



Source: Kvaerna, T., and F. Ringdal. "Detection Capability of the Seismic Network of the International Monitoring System for the Comprehensive Nuclear-Test-Ban Treaty." Bulletin of the Seismological Society of America 103, no. 2A (2013): 759-72

Yield estimations

Mb	Yield (Nevada)	Yield (Lop Nor)
3.2	0.02 kt	0.07 kt
3.4	0.04 kt	0.14 kt
3.6	0.07 kt	0.25 kt
3.0: Europe, US, Central Asia	11.7 t	39.8 t

Unique features

- Data available to all state parties in near real time.
- CTBTO not to make a compliance or non-compliance determination.
- It is up to the member states to respond to suspicious events.



On-site inspections

Final verification measure

Future

Forecasting

- The verification regime is more effective than originally designed (aimed for 1 kT worldwide).
- Modern communications, data processing and storage technologies will make it even more sensitive and responsive.
- Political will key problem. May need to enter into force provisionally due to excessively stringent EIF criteria.

Discussion