



EXPLORATION DRILLING: CANADA AND INTERNATIONAL

MIKE DUFFY, 13MAY2015
CIM CONFERENCE MONTREAL

Atlas Copco

Agenda

Drilling Exploration Basics 6:00

- The Exploration Business 2:40
- What is Core Drilling 1:50
- Components 1:40

Agenda

Drilling Exploration Basics 6:00

- The Exploration Business 2:40
- What is Core Drilling 1:50
- Components 1:40

Where in the world 6:00

- Geology of the Earth
- Mineral Deposits
- Australia, China
- Africa, North America
- Deep Sea

Agenda

Drilling Exploration Basics 6:00

- The Exploration Business 2:40
- What is Core Drilling 1:50
- Components 1:40

Where in the world 6:00

- Geology of the Earth
- Mineral Deposits
- Australia, China
- Africa, North America
- Deep Sea

Atlas Copco AB 4:00

- Overview
- Hole Drilling Applications
- Industry Challenges
- Commitment to Society

Agenda

Drilling Exploration Basics 6:00

- The Exploration Business 2:40
- What is Core Drilling 1:50
- Components 1:40

Where in the world 6:00

- Geology of the Earth
- Mineral Deposits
- Australia, China
- Africa, North America
- Deep Sea

Atlas Copco AB 4:00

- Overview
- Hole Drilling Applications
- Industry Challenges
- Commitment to Society

Comparison to Space Exploration 3:00

- Drills Big and Small
- Why is AC interested in SE

Final Comments

Agenda

Drilling Exploration Basics 6:00

- The Exploration Business 2:40
- What is Core Drilling 1:50
- Components 1:40

Where in the world 6:00

- Geology of the Earth
- Mineral Deposits
- Australia, China
- Africa, North America
- Deep Sea
- World's Deepest Bore Hole

Atlas Copco AB 4:00

- Overview
- Hole Drilling Applications
- Industry Challenges
- Commitment to Society

Comparison to Space Exploration 3:00

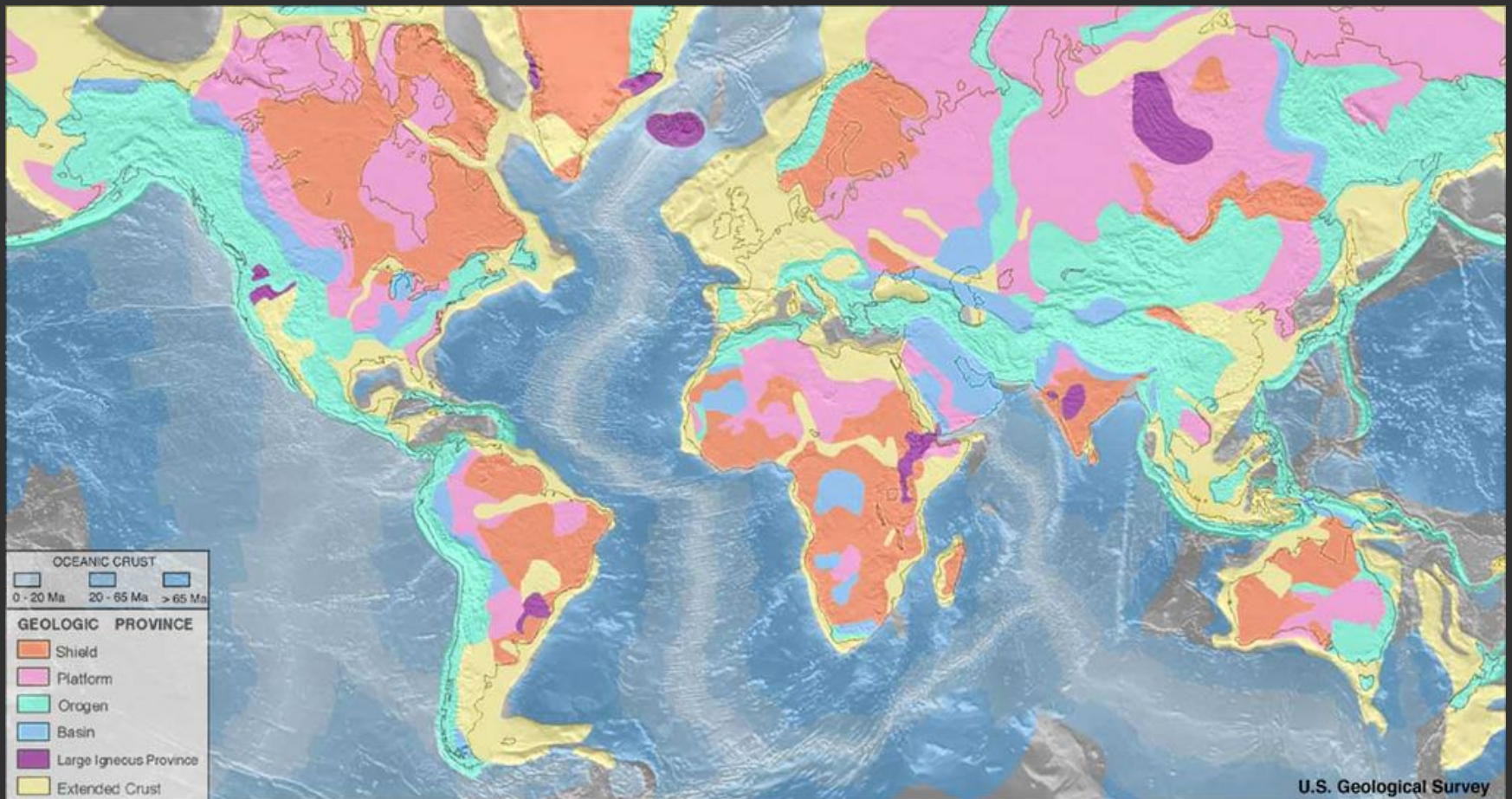
- Drills Big and Small
- Why is AC interested in SE

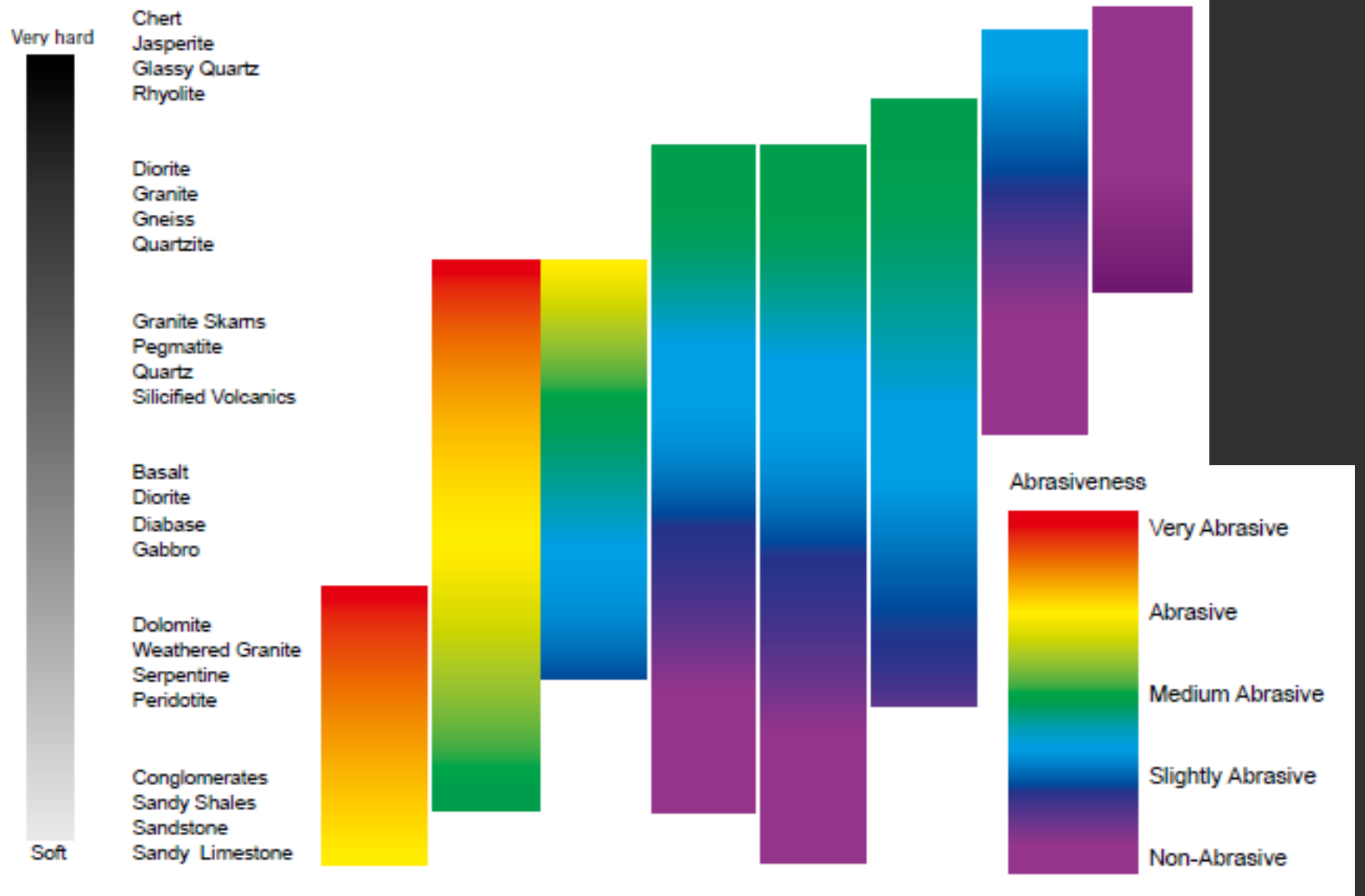
Final Comments

Drilling Exploration Basics

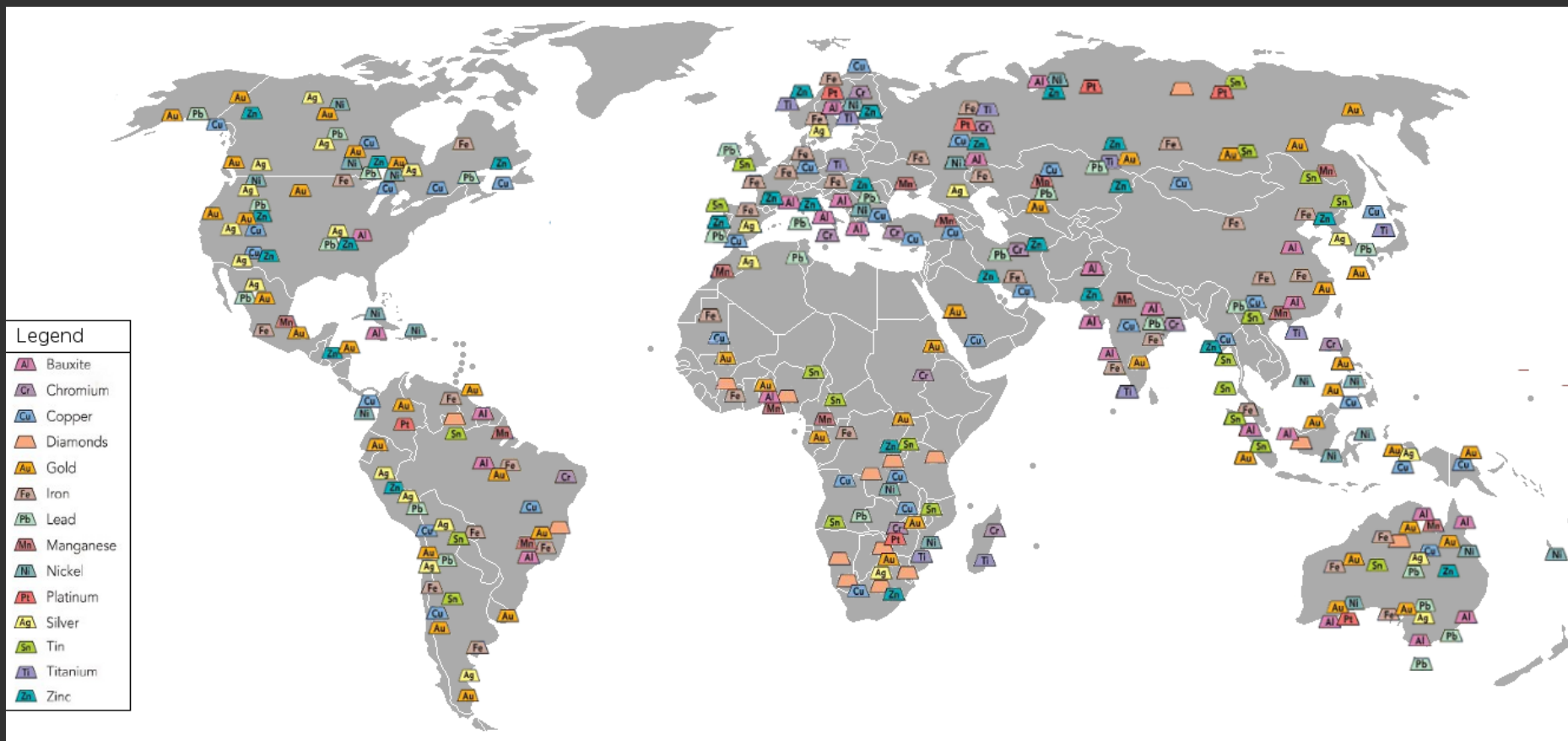
Where in the World

Geology of the Earth



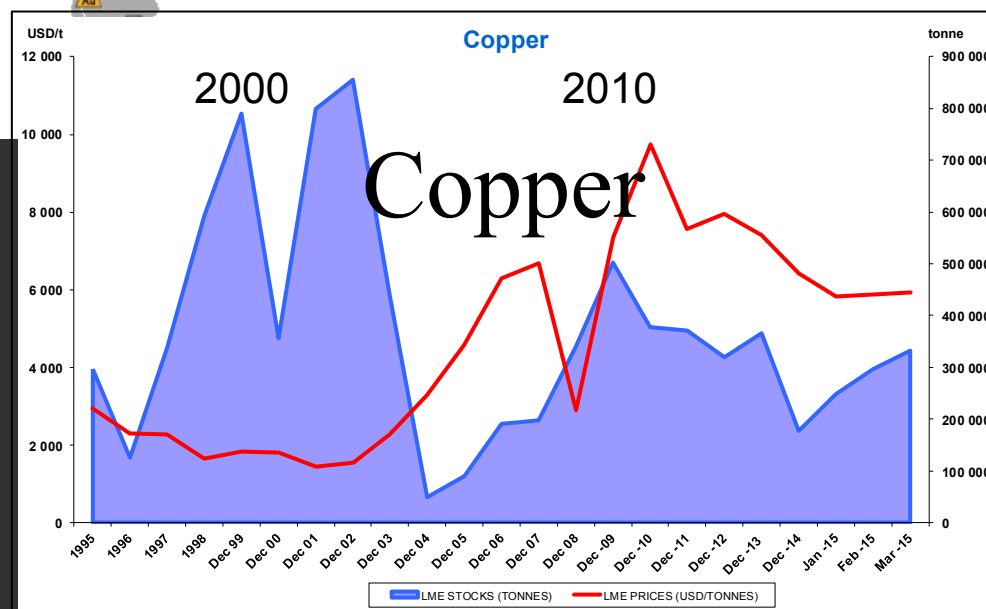
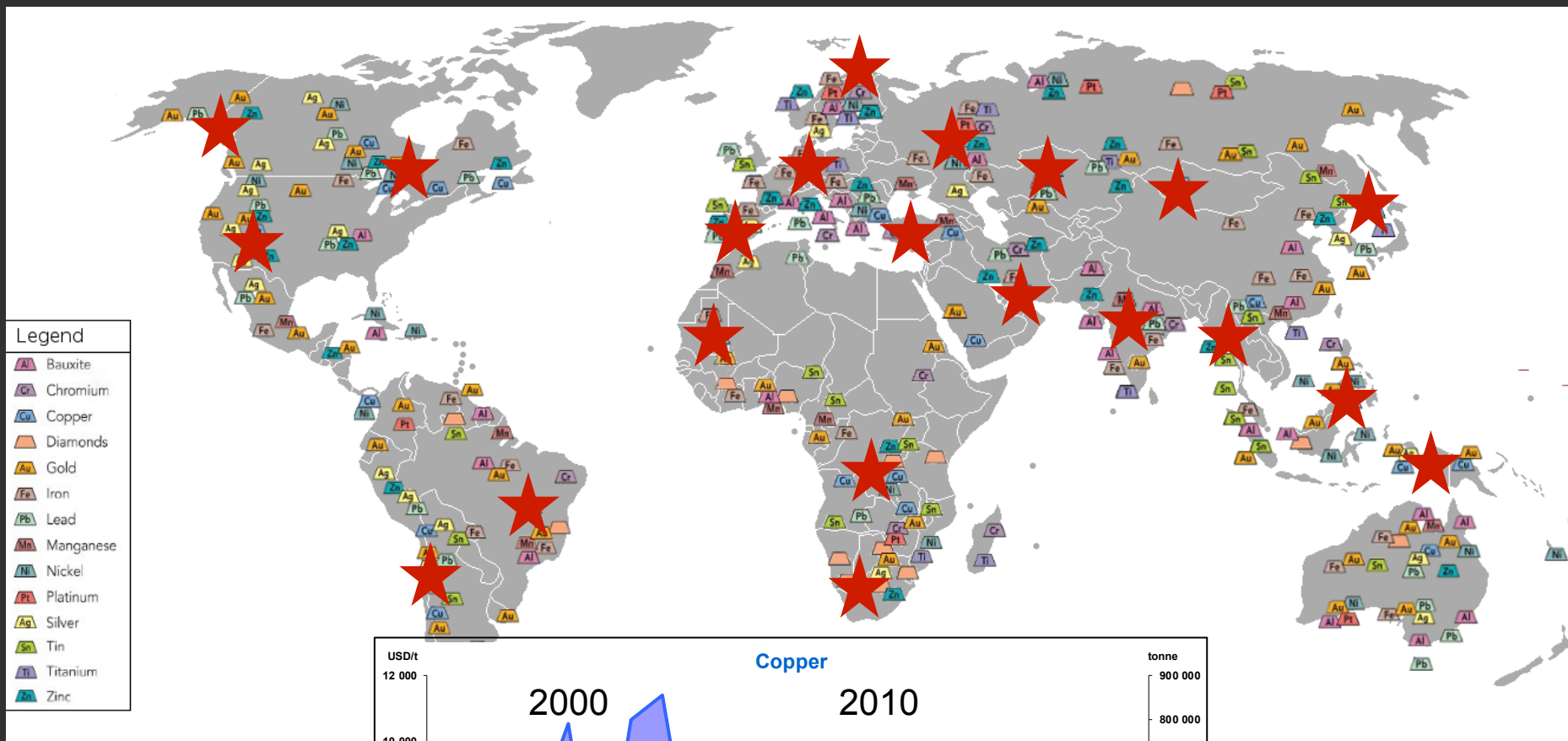


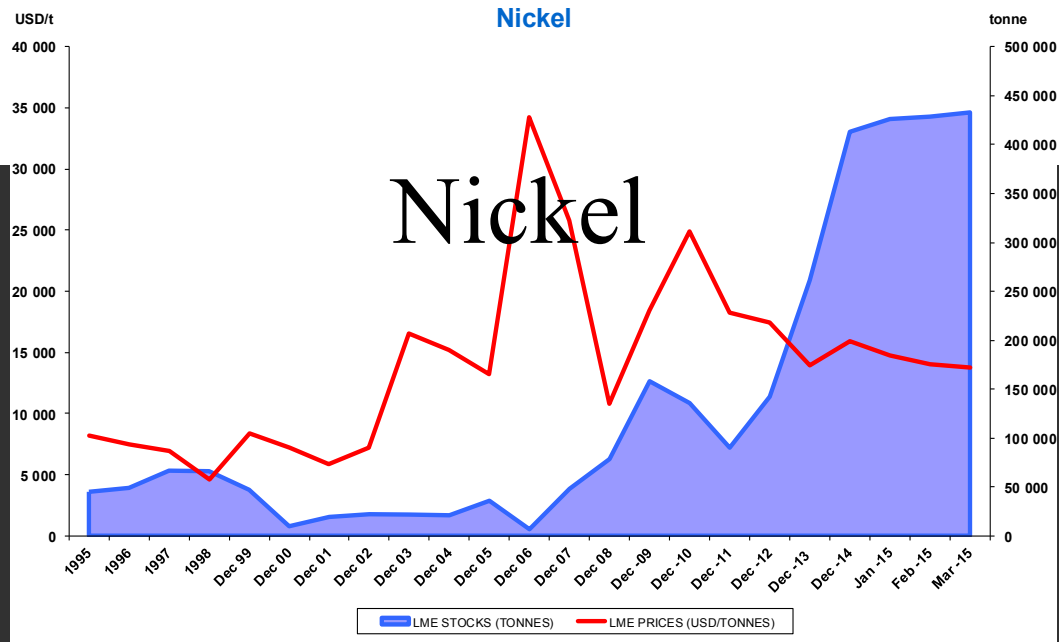
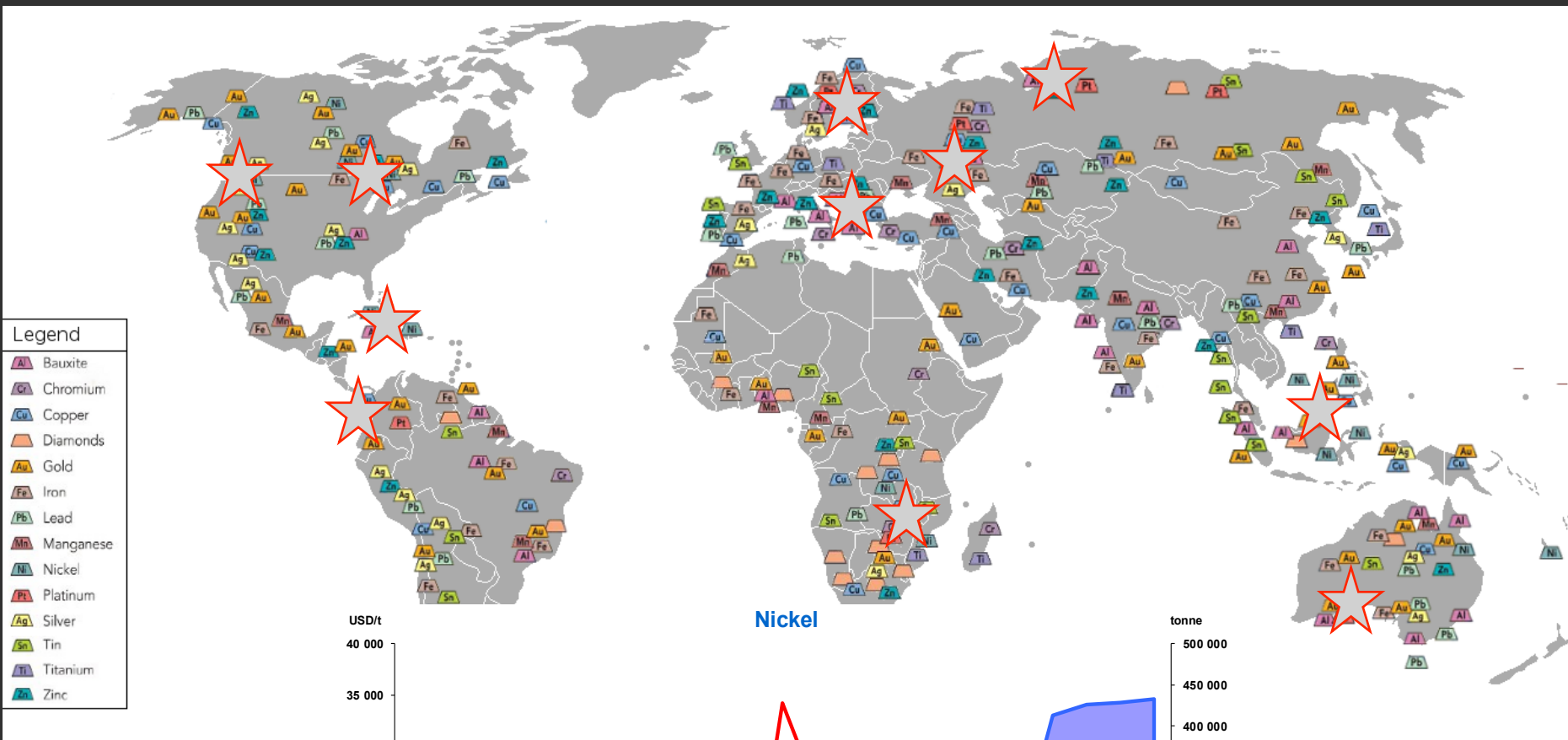
Mineral Deposits

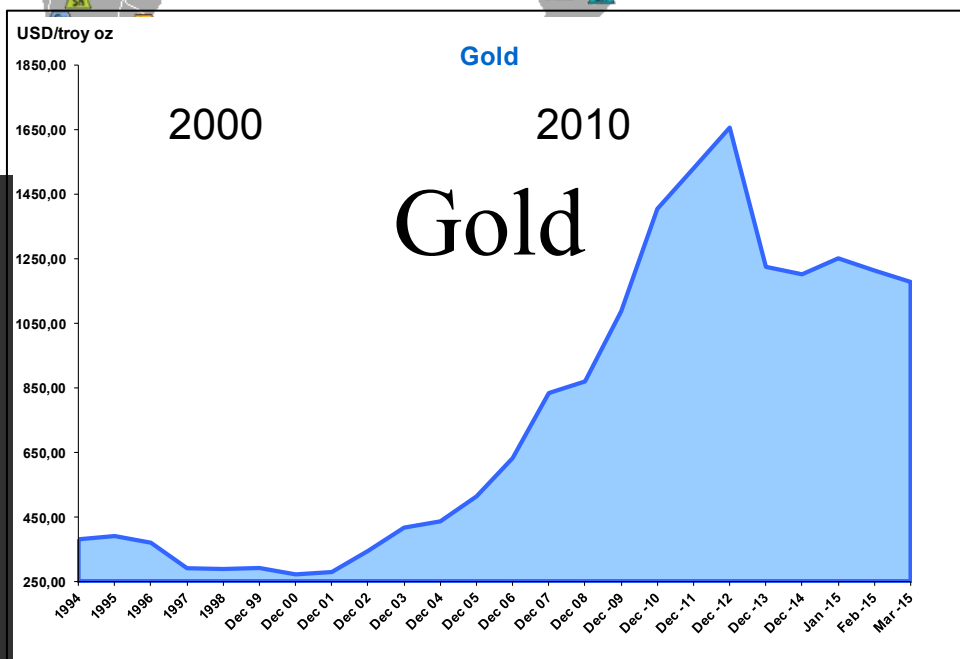
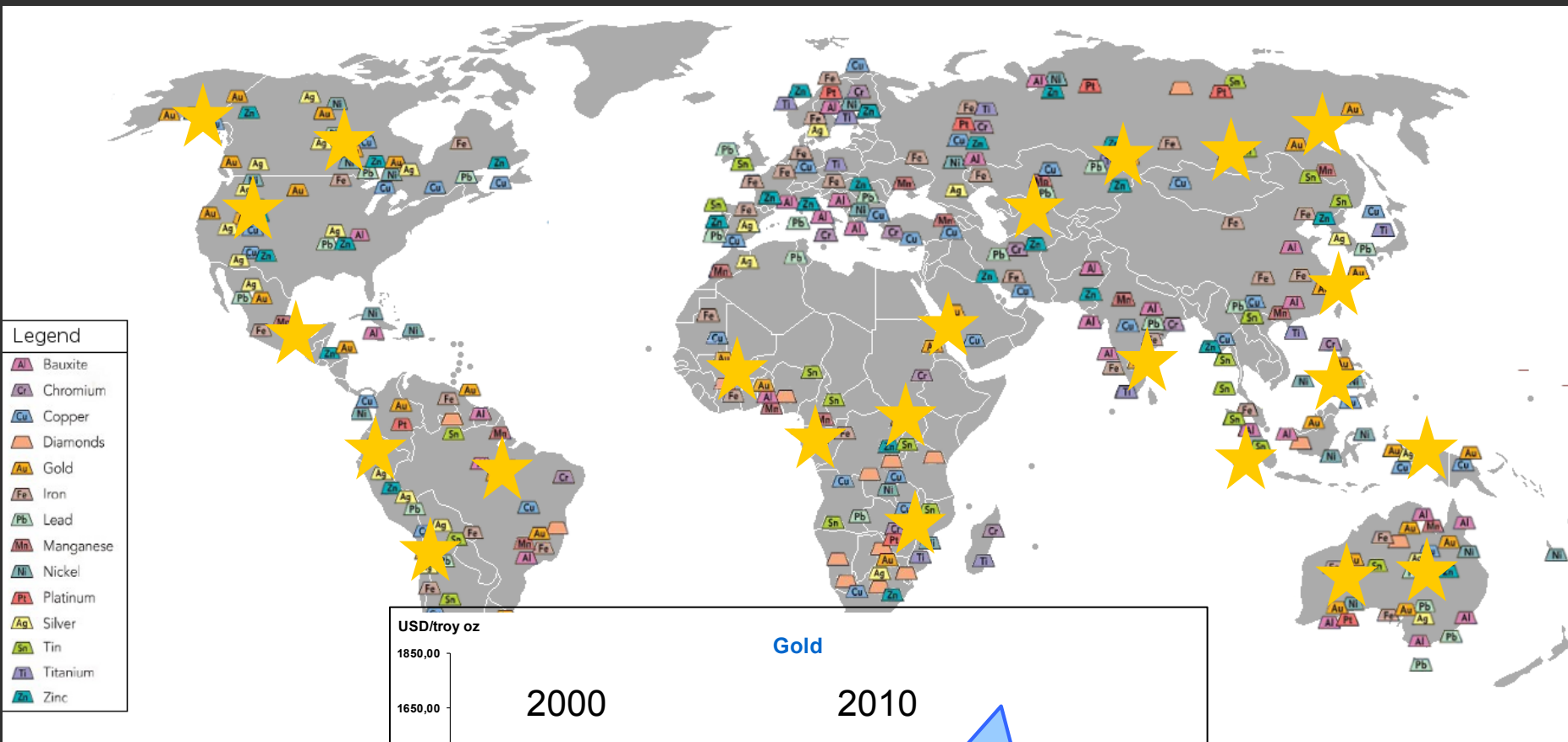


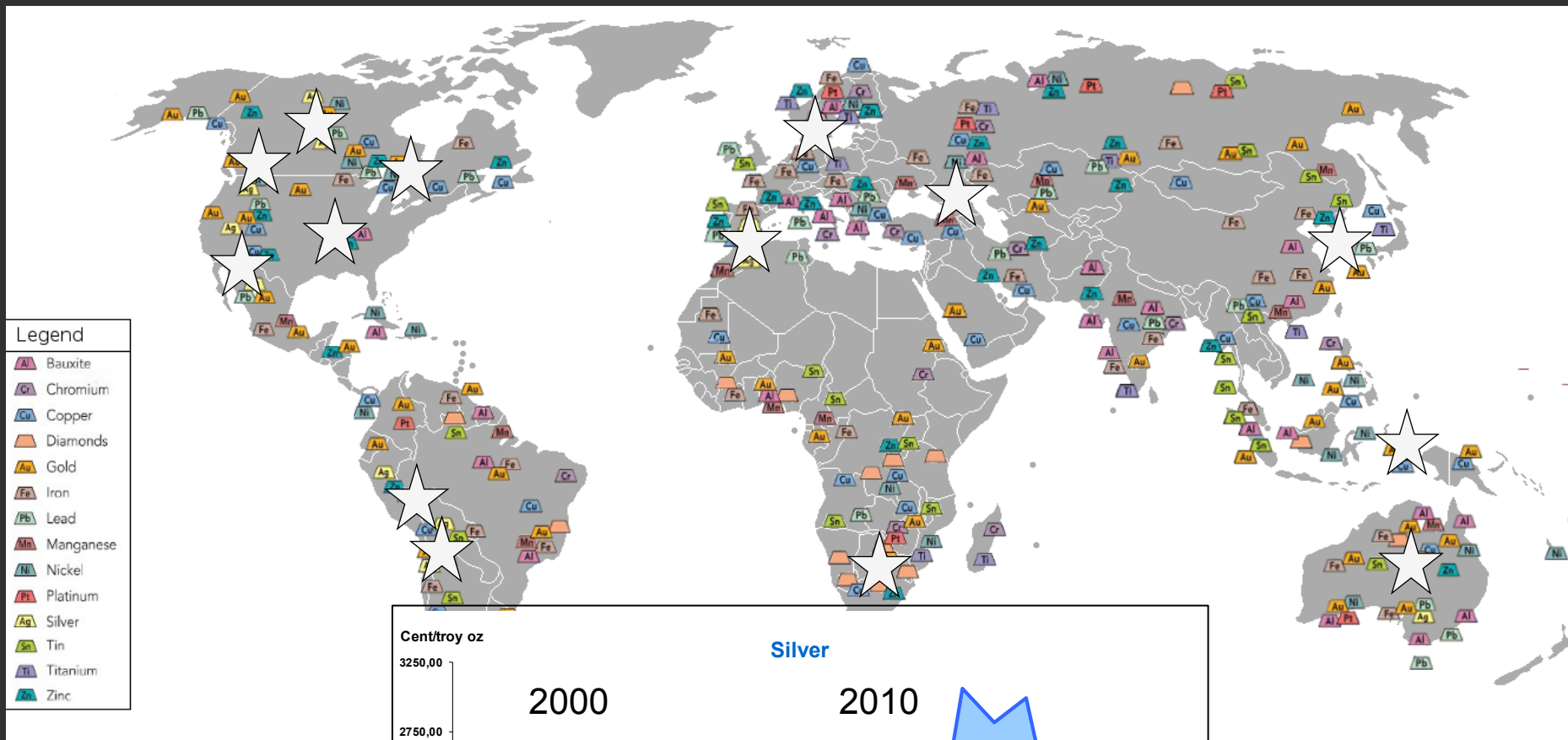
http://commons.wikimedia.org/wiki/File:Simplified_world_mining_map_2.png

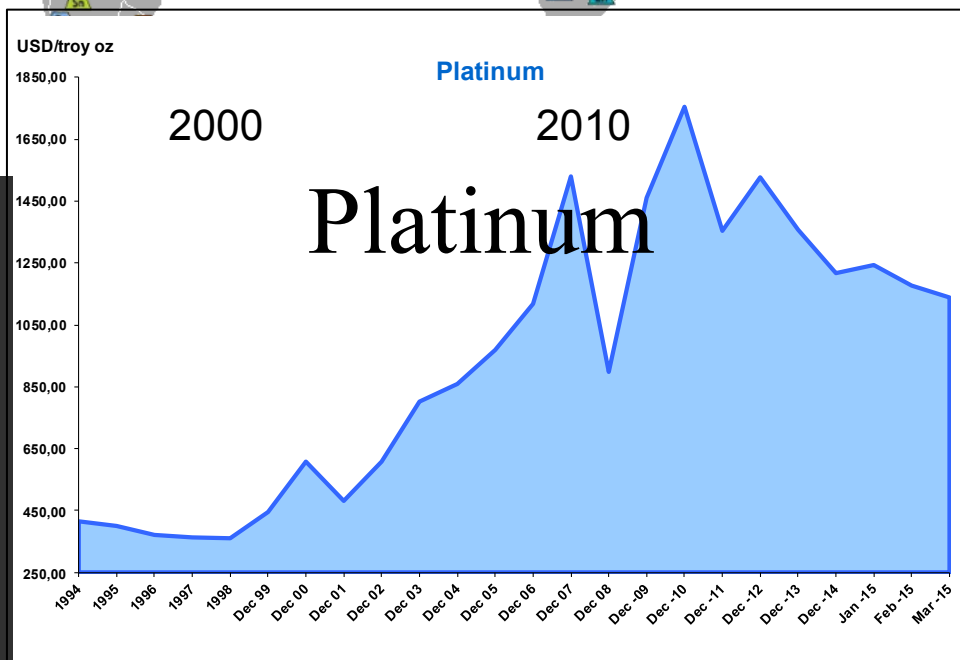
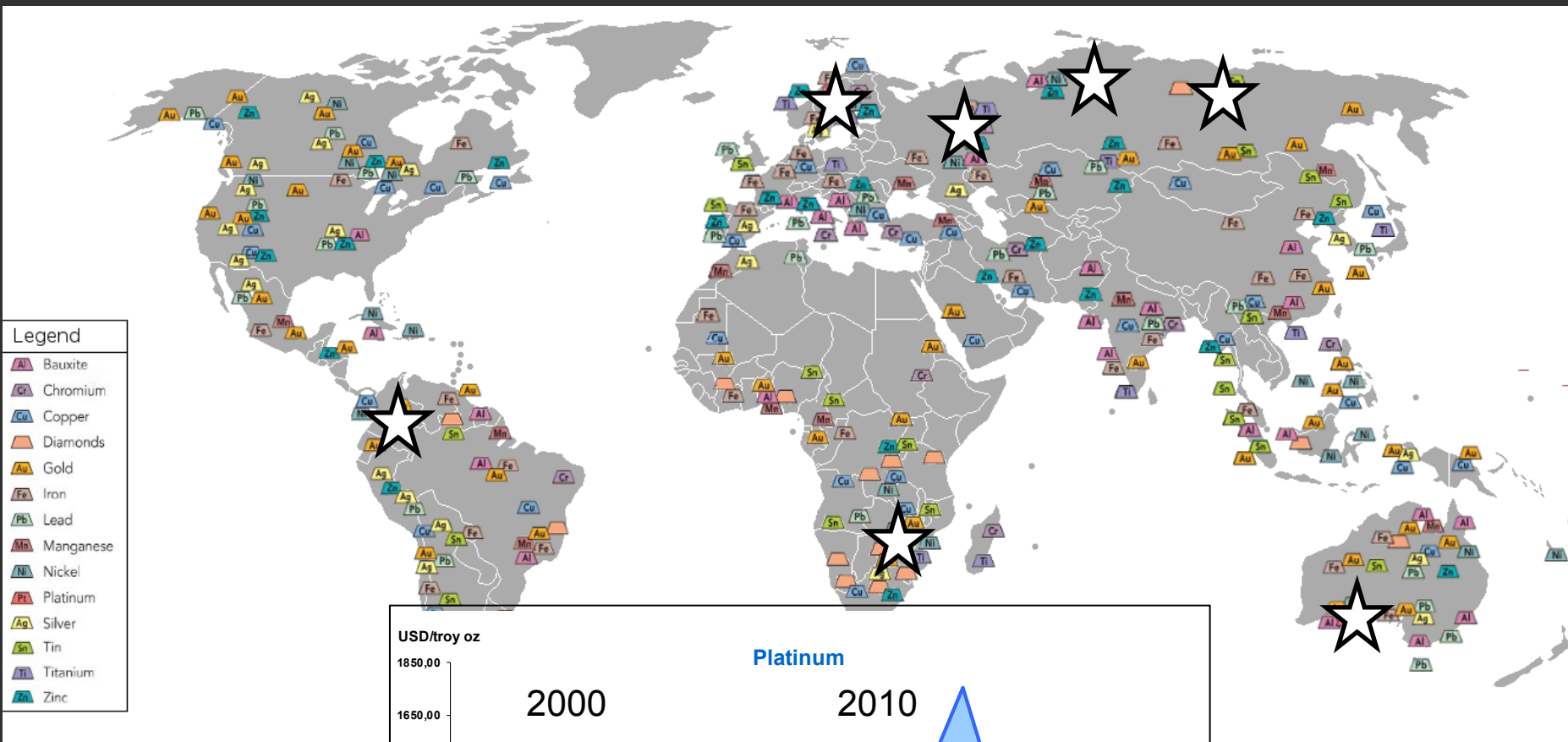
JANUARY 2009







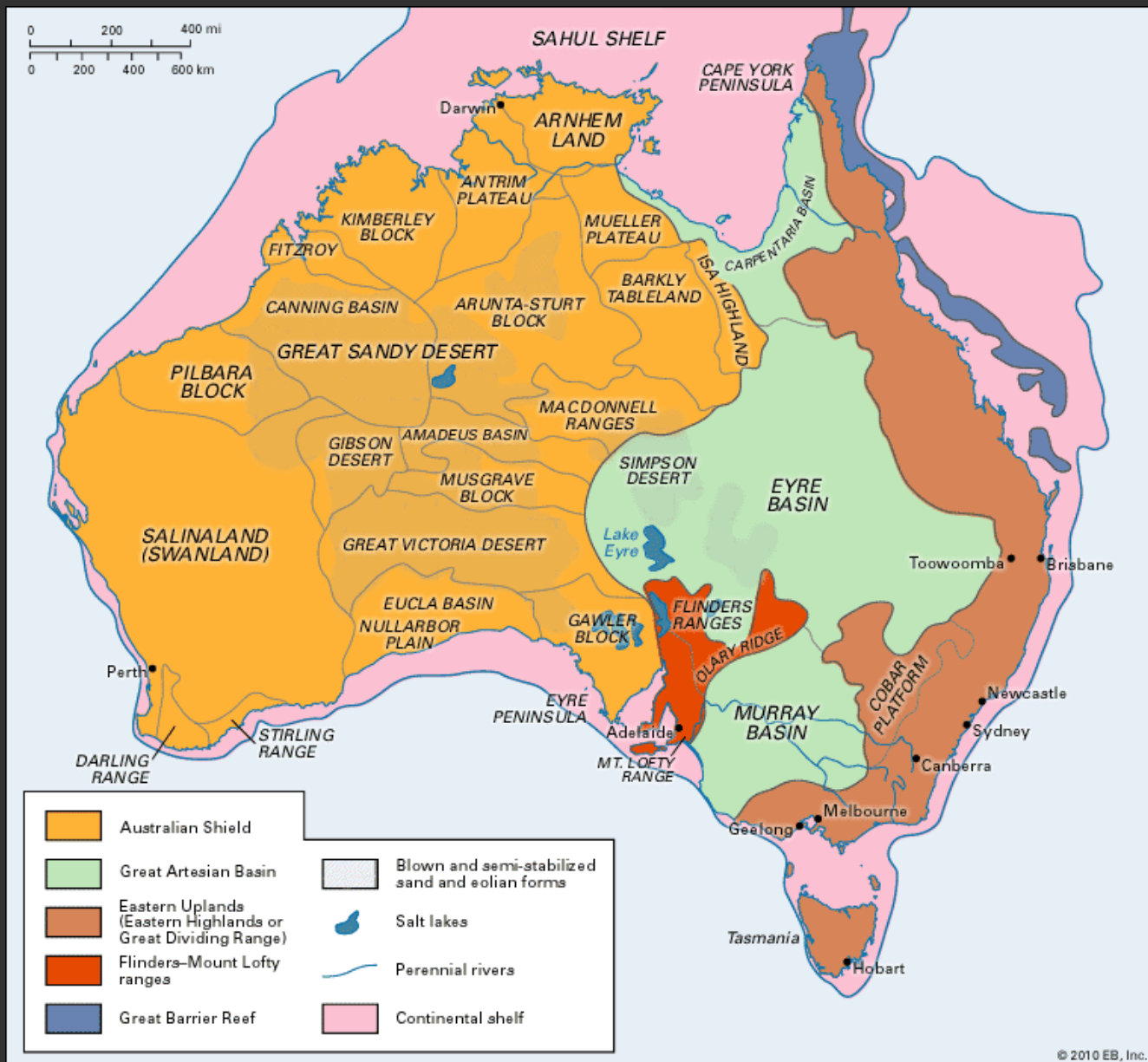




Where are diamonds found?

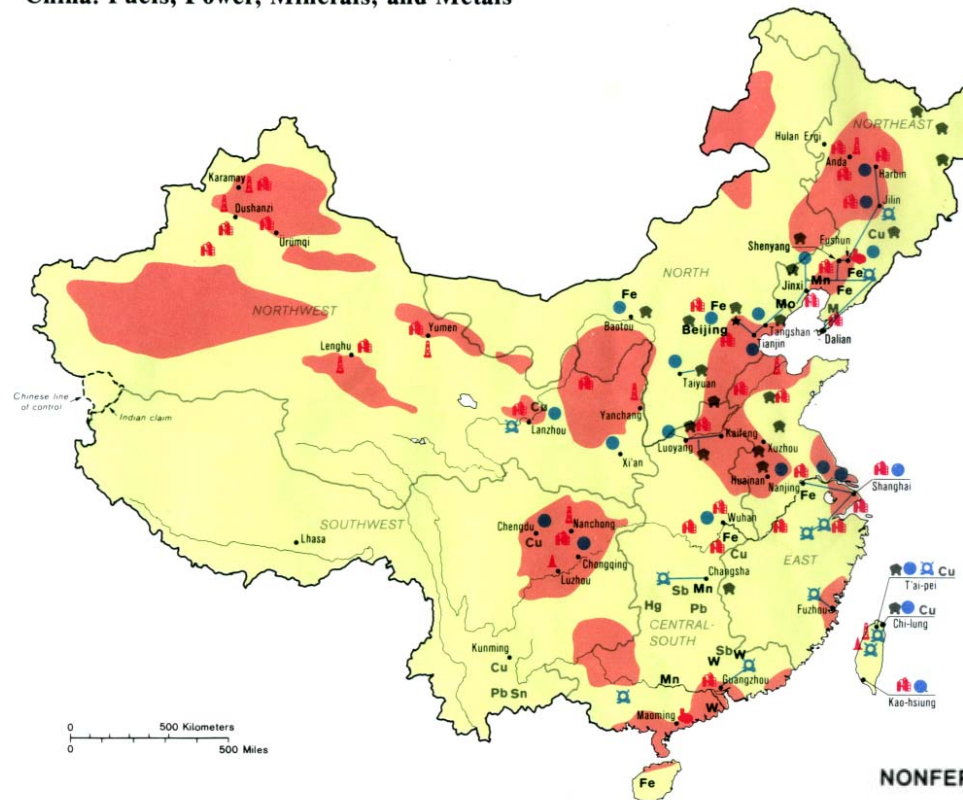


Australia, China



Australia: physiographic regions. Map/Still. Britannica Online for Kids. Web. 21 Mar. 2015

China: Fuels, Power, Minerals, and Metals



FUELS

- Petroleum refinery
- Shale oil refinery
- Oilfield
- Gasfield
- Oil basin
- Major coal mine

ELECTRIC POWER

- Thermal plant
- Hydro plant
- Transmission line

NONFERROUS

- Sb Antimony
- Cu Copper
- Pb Lead and zinc
- M Magnesite
- Hg Mercury
- Sn Tin

FERROUS AND FERROALLOY

- Fe Iron ore
- Mn Manganese
- Mo Molybdenum
- W Tungsten

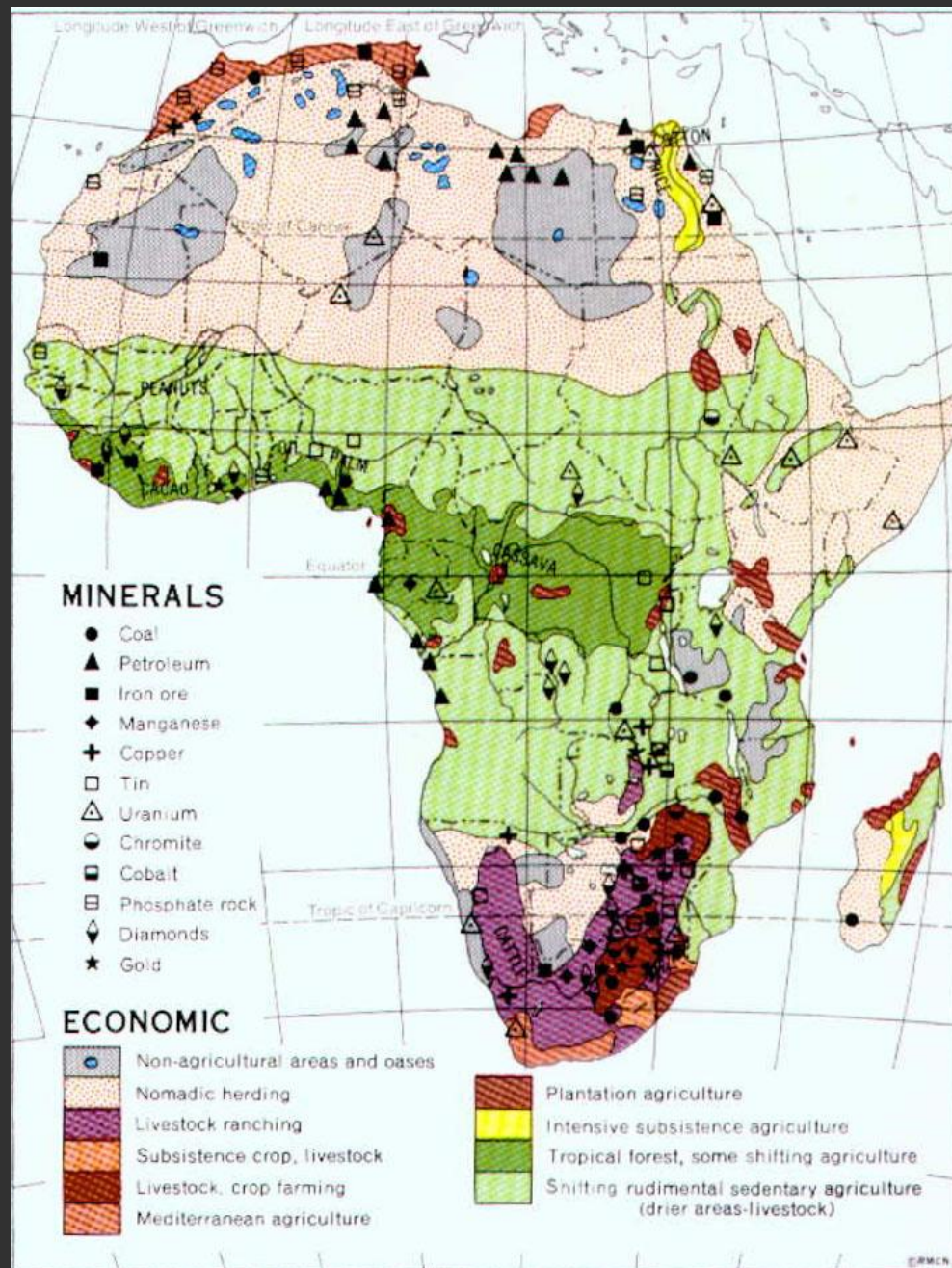
NONFERROUS

- Sb Antimony
- Cu Copper
- Pb Lead and zinc
- M Magnesite
- Hg Mercury
- Sn Tin

FERROUS AND FERROALLOY

- Fe Iron ore
- Mn Manganese
- Mo Molybdenum
- W Tungsten

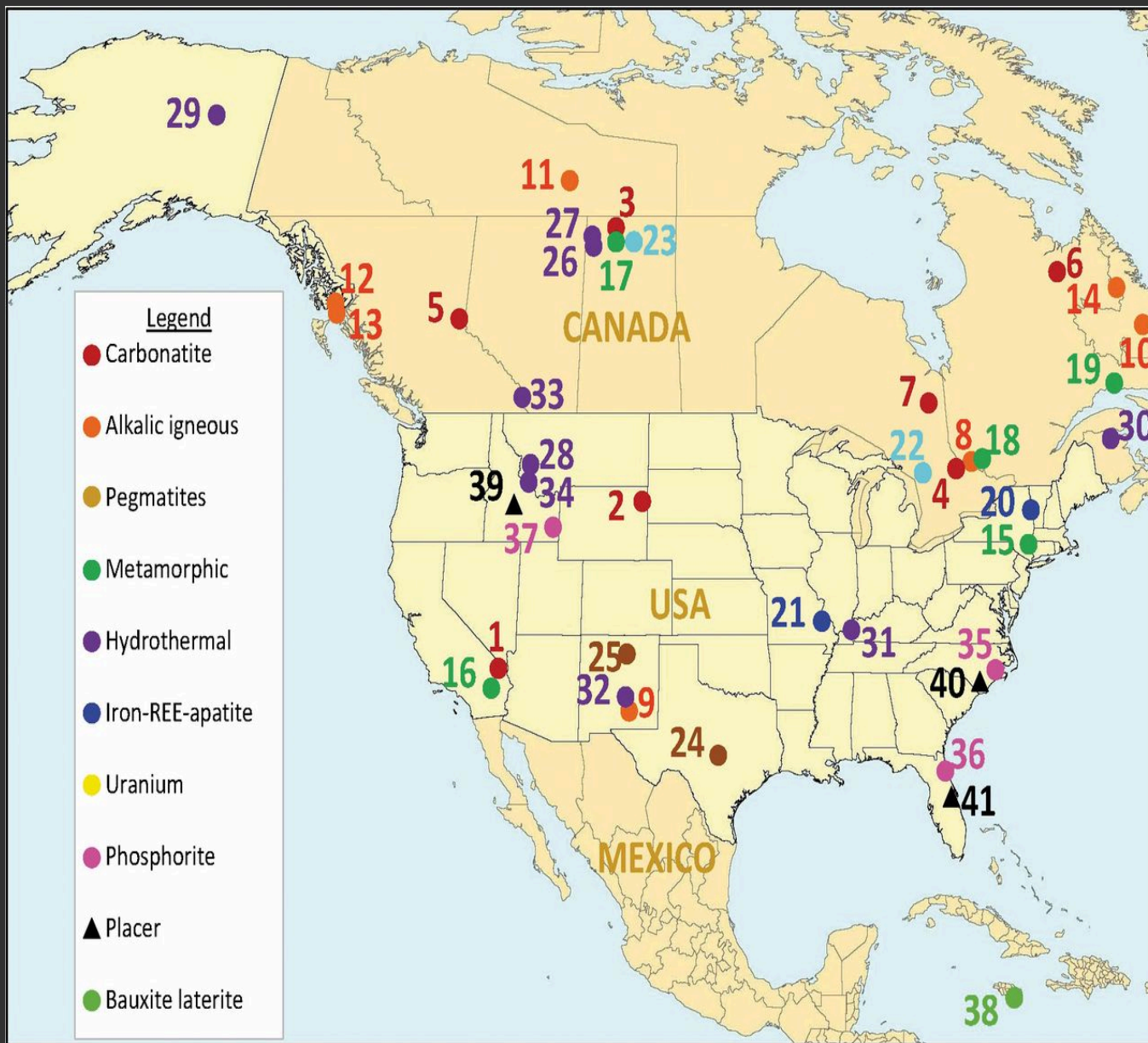
Africa, North America



North America



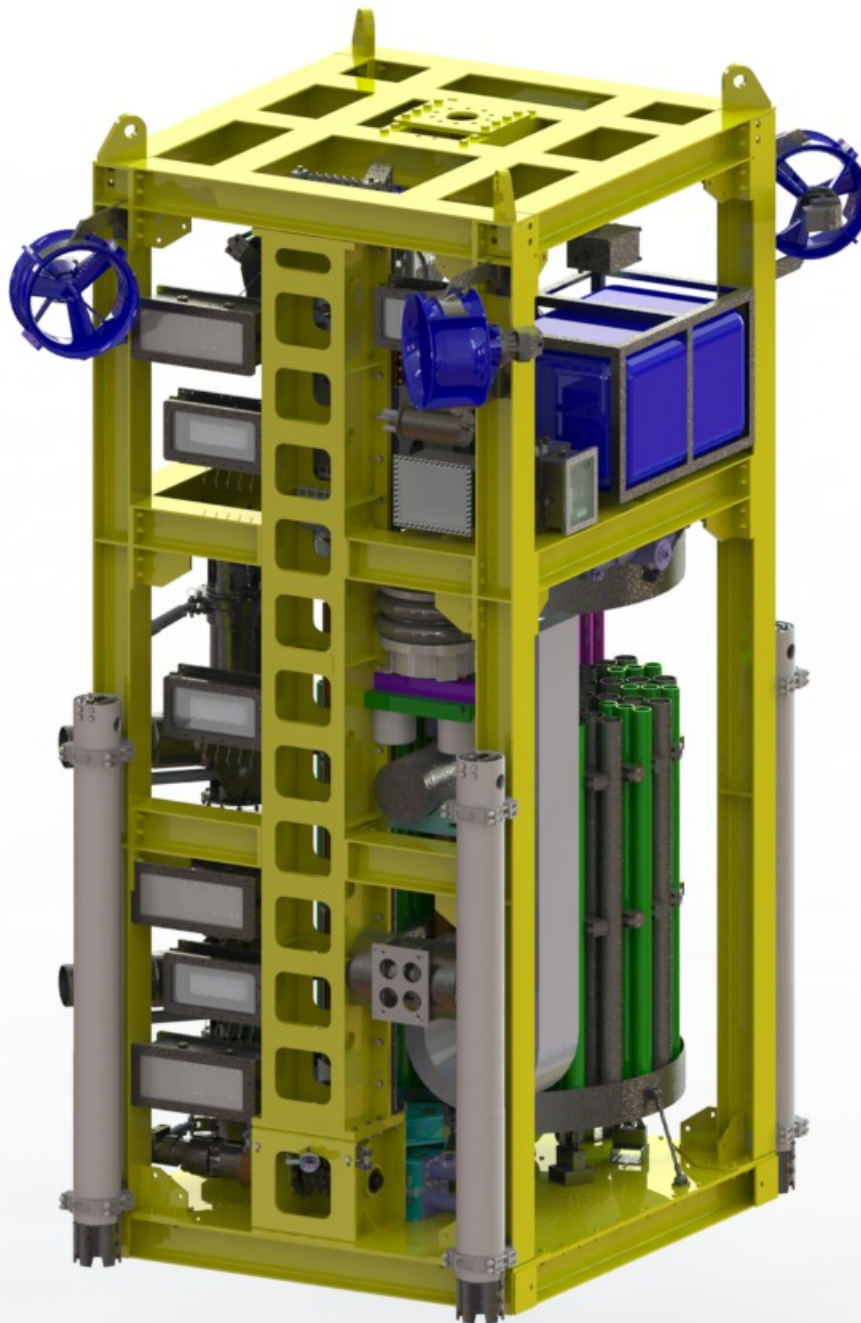
North America: physiographic regions. Map/Still. Britannica Online for Kids. Web. 21 Mar. 2015



Rare Earth Mining and Exploration in North America, Mariano and Mariano

<http://elements.geoscienceworld.org/content/8/5/369.abstract>

Deep Sea



World's Deepest Bore Hole

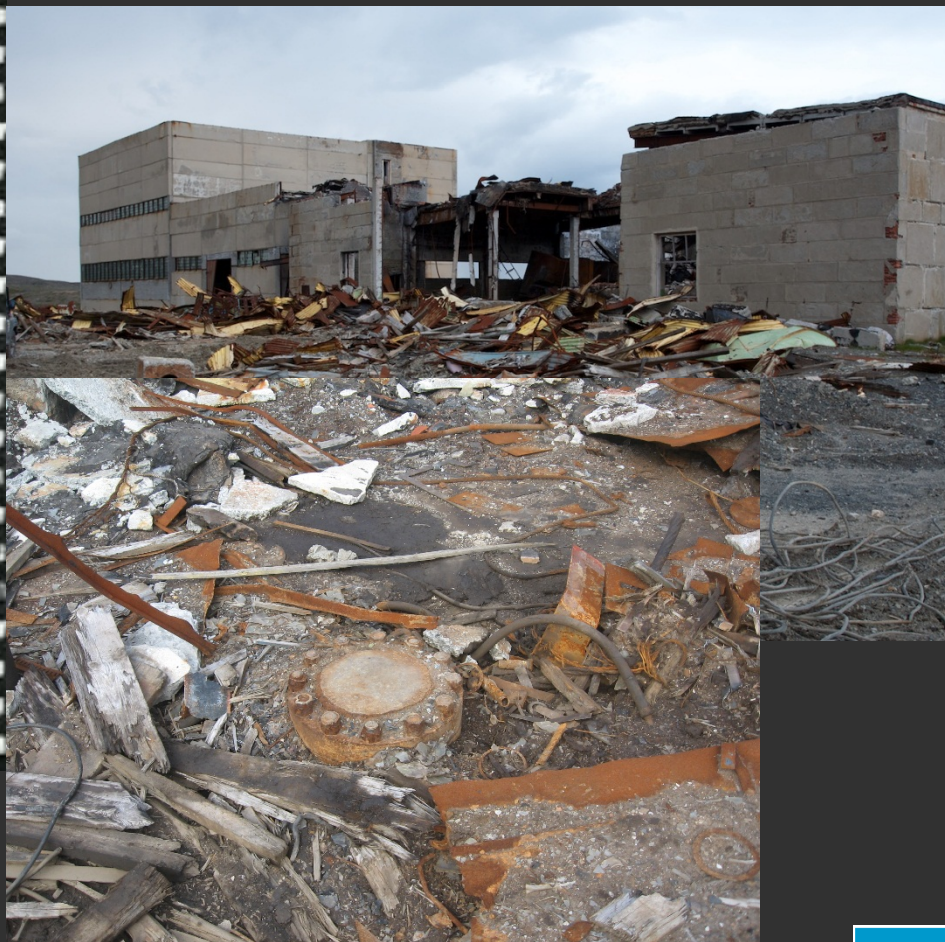


Started May 1970

Goal 15000 meters deep

Maximum depth of 12.3 km reached in 1989, drilling stopped in 1992 due to high temperatures





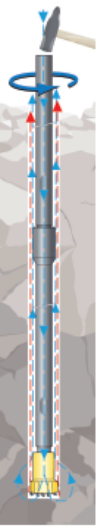
Atlas Copco AB

Overview

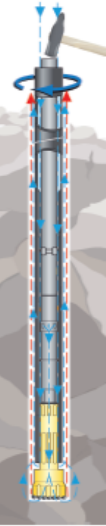
Hole Drilling Applications

10 DRILLING METHODS WITH SECOROC ROCK DRILLING TOOLS

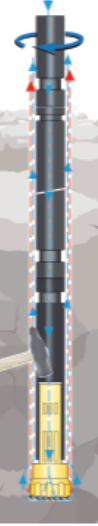
TOPHAMMER DRILLING



COPROD DRILLING



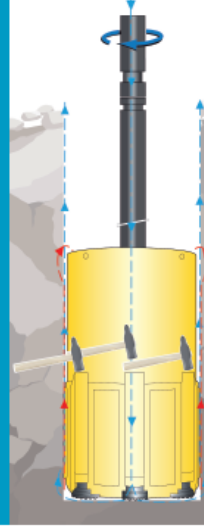
DOWN-THE-HOLE DRILLING



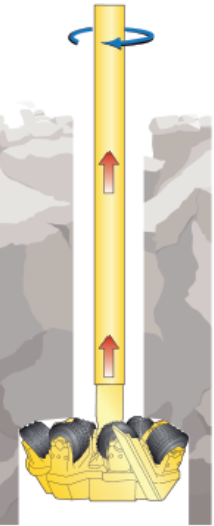
REVERSE CIRCULATION DRILLING



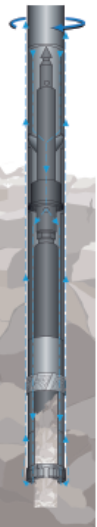
CLUSTER DRILLING



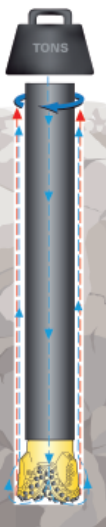
RAISEBORING



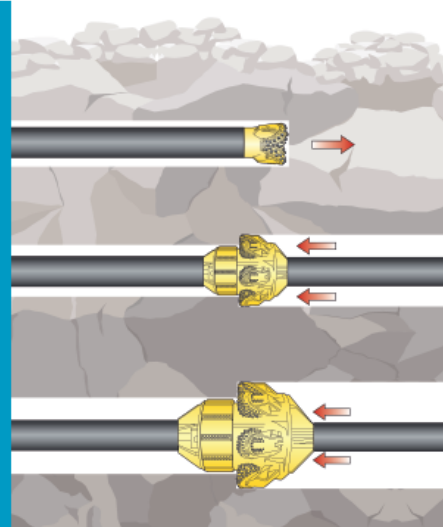
CORE DRILLING



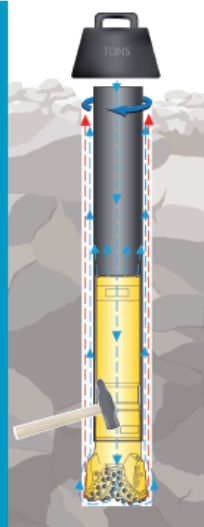
ROTARY DRILLING



HORIZONTAL DIRECTIONAL DRILLING



PERCUSSION ASSISTED ROTARY DRILLING



--- CUTTINGS
 --- AIR FLOW*
 *CORE DRILLING - WATER FLOW



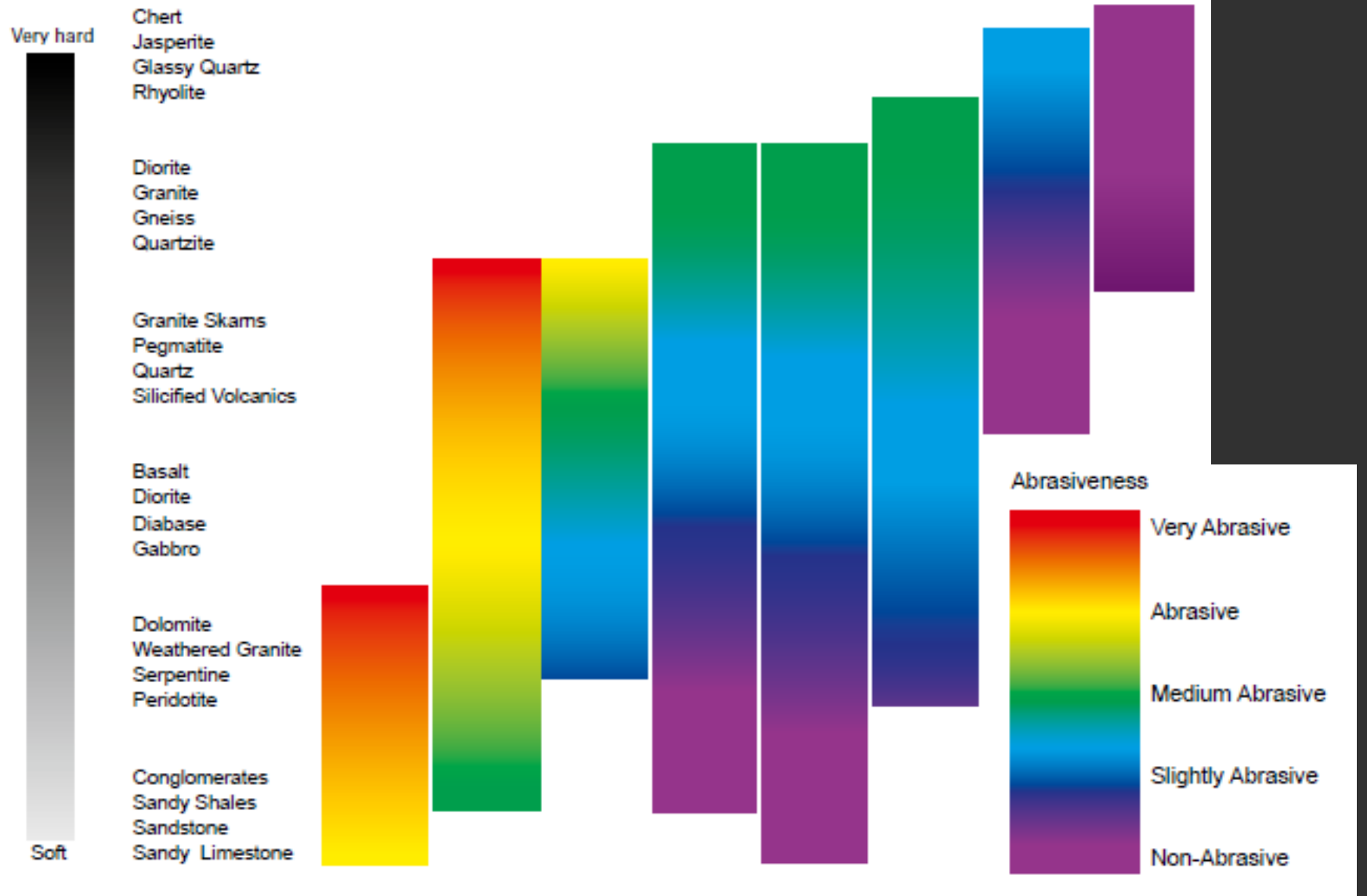
North Bay Ontario

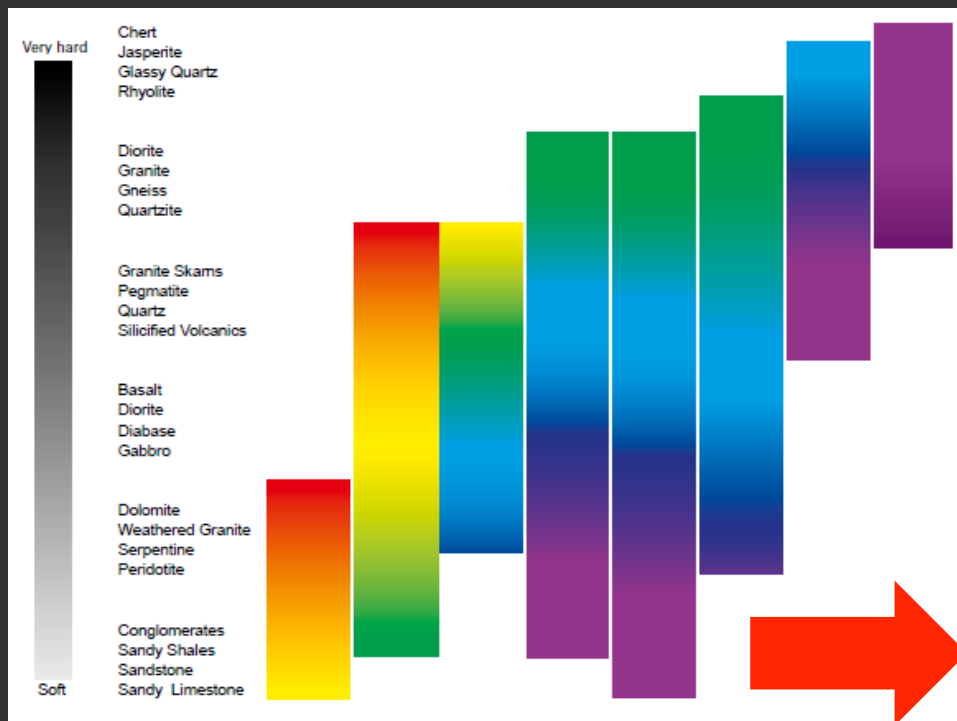


Core Drilling Bits

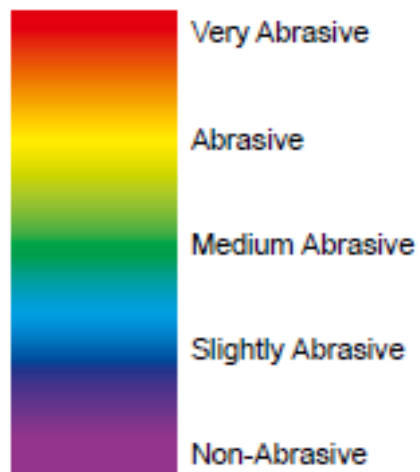
Sinusoidal field tests have shown that our Truform line of core drilling bits will outperform in the toughest of drilling conditions.







Abrasiveness



Channel flushing (CF)

- Standard profile - general purpose design
- Suitable for a broad range of formations.



Extended channel flushing (ECF)

- Preferable in competent and semi-broken rock
- Suitable for mixed formations containing broken and competent zones.



Wedge (pie shaped)

- Superior flushing capability
- Improved productivity
- Preferable in abrasive or broken rock.



Torpedo "V"

- High performance "free cutting" bit
- High productivity
- Suitable for hard/competent formations.



Turbo

- High productivity
- Suitable for competent formations.



Face discharge (FD)

- Designed to minimise flushing of core sample
- Suitable for broken/granular formations.

Industry Challenges

Commitment to Society



WATER FOR ALL – 30 YEARS OF EMPLOYEE COMMITMENT

In 2014, the Atlas Copco Group's main community engagement initiative *Water for All* celebrated 30 years. It was founded in 1984 by Atlas Copco employees and supports projects that give people in need access to clean drinking water. By the end of 2014, the initiative had representation in more than 35 countries, with more under way. All local chapters are initiated and run by Atlas Copco employees who also contribute to the same through donations, often via their salaries. All donations are doubled by the company. Since the start, *Water for All* has provided access to clean drinking water to more than 1.5 million people.

More information:
www.water4all.org



Atlas Copco Annual Report 2014



Comparison to Space Exploration

Drills Big and Small



20 Nm

200 N

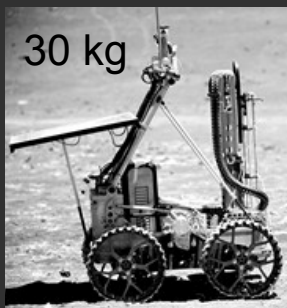
4 meters



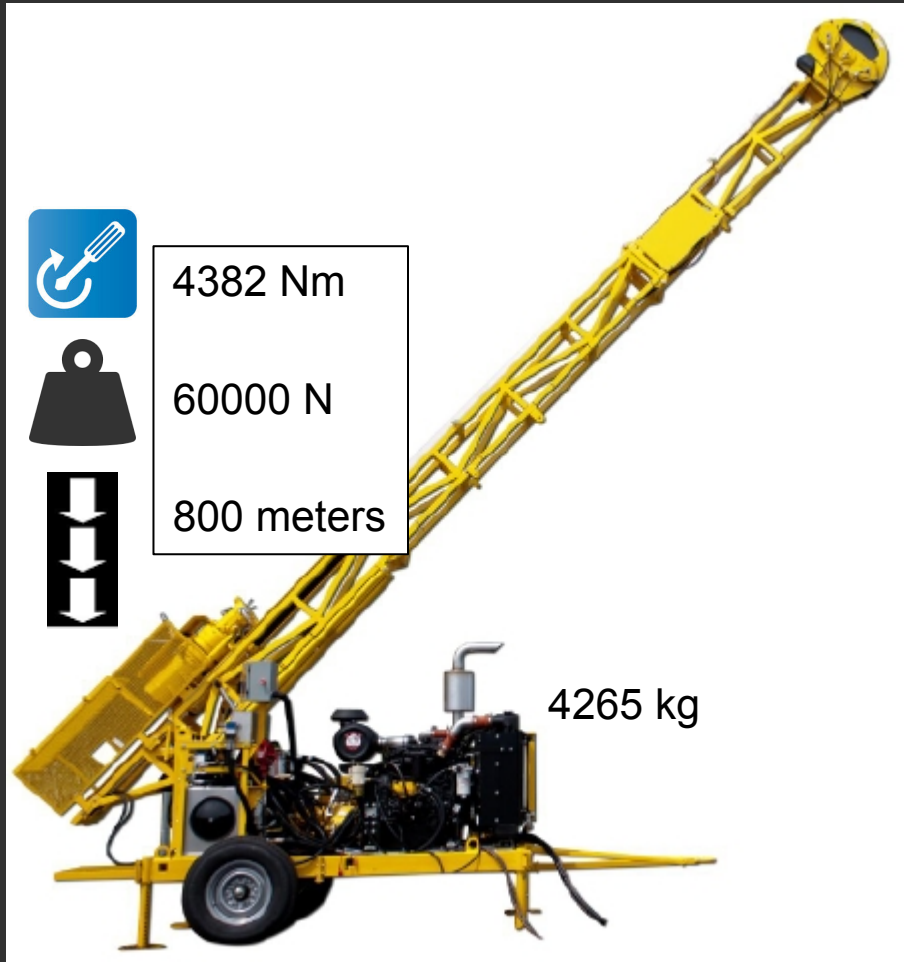
4382 Nm

60000 N

800 meters



30 kg



4265 kg

Why get involved?

When do we as a company get involved?

- Directly profitable (direct sales)?

When do we as a company get involved?

- Directly profitable?
- Indirectly profitable (PR, technology incubation)?

When do we as a company get involved?

- Directly profitable?
- Indirectly profitable?
- Contributes to the common good (employees)?

When do we as a company get involved?

- Directly profitable?
- Indirectly profitable?
- Contributes to the common good?
- Contributes to the common good (everyone)?

When do we as a company get involved?

- Directly profitable?
- Indirectly profitable?
- Contributes to the common good?
- Contributes to the common good?
- More?

When do we as a company get involved?

- Directly profitable?
- Indirectly profitable?
- Does it contribute to the common good?
- Does it contribute to the common good?
- More?

“I just wish the world was twice as big
and half of it was still unexplored.”

David Attenborough

Final Comments

“A blade of grass is a commonplace on Earth;
it would be a miracle on Mars.”

Carl Sagan, *Pale Blue Dot: A Vision of the Human Future in Space*

The logo consists of a white rectangular box with a thin black border. Inside the box, there are two solid blue horizontal bars, one at the top and one at the bottom. The text "Atlas Copco" is centered between these bars in a blue, italicized, serif typeface.

Atlas Copco

Questions