

# Turkish Delights

## The Geology of Turkey



Mark Grodner

# Istanbul



# Istanbul



# But enough of Istanbul



# At the joining of continents

## Alpine Mountain Chain - Tertiary Age

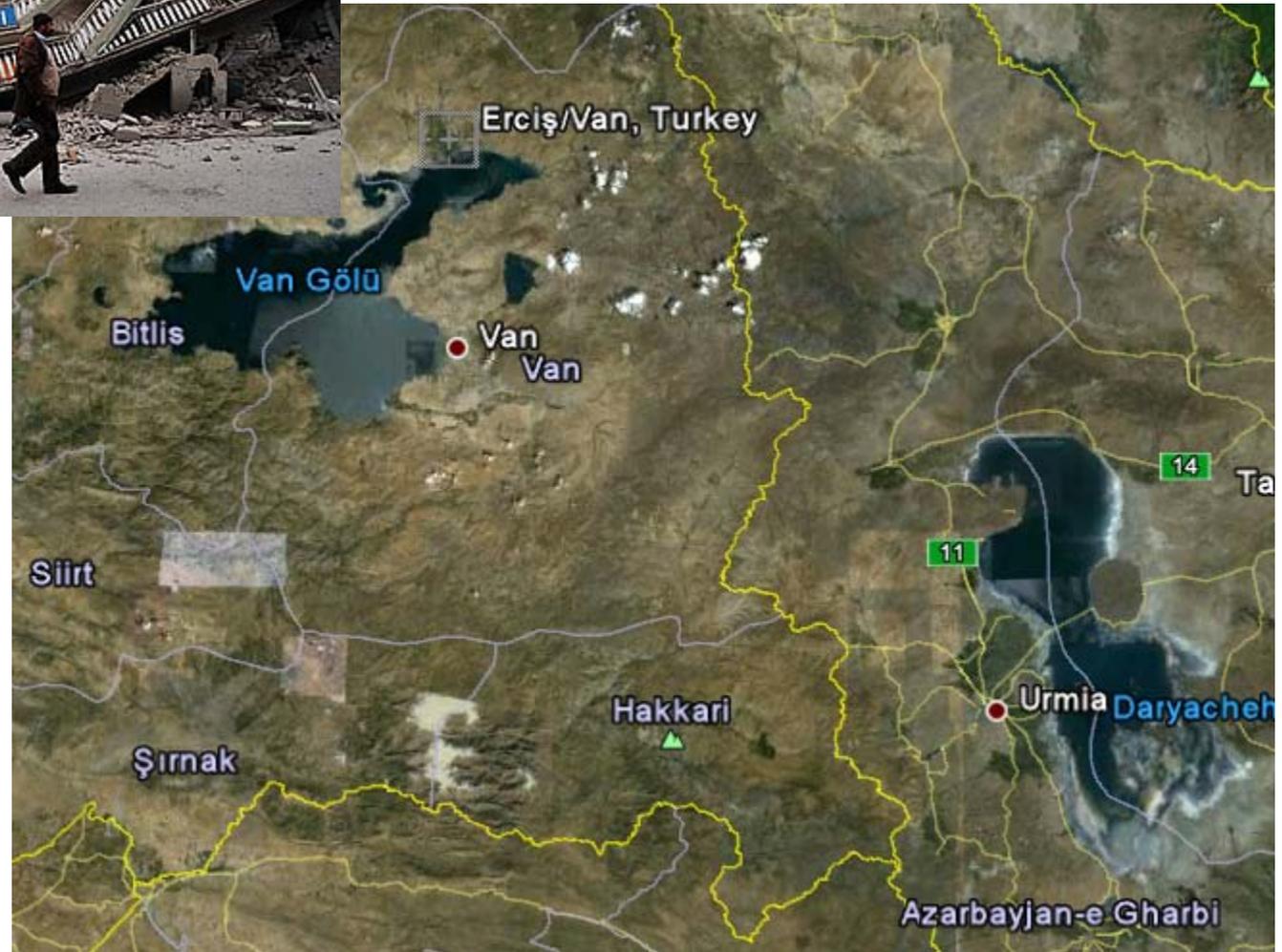
- Formed as the Arabian, African, and Indian plates collided with the Eurasian plate

Still active as the African Plate converges with the Eurasian Plate. Anatolian Plate escapes towards the west and southwest via

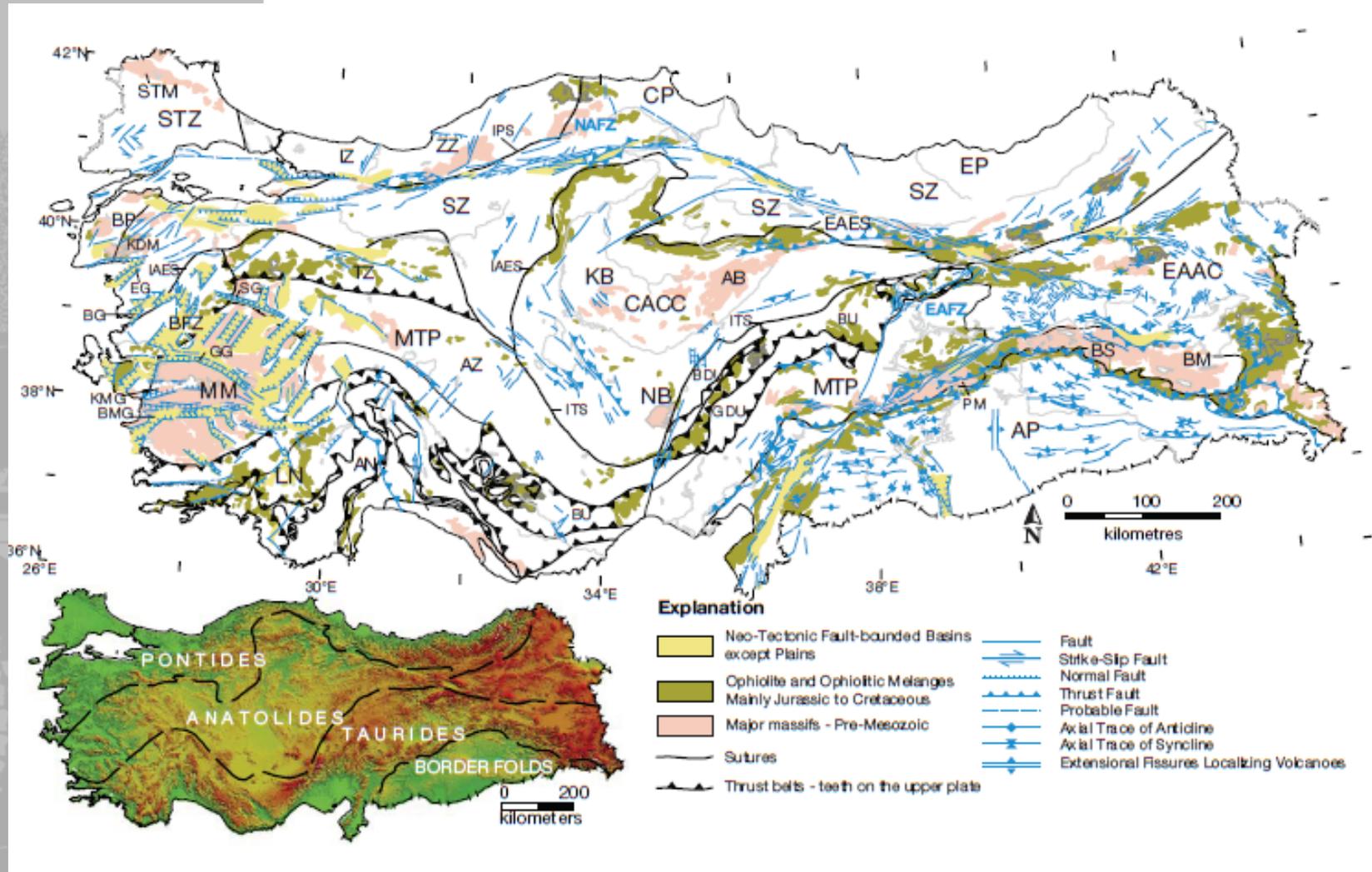
- North Anatolian Fault Zone (near the Black Sea)
- East Anatolian Fault Zone

Seismically active

# Sunday's Quake



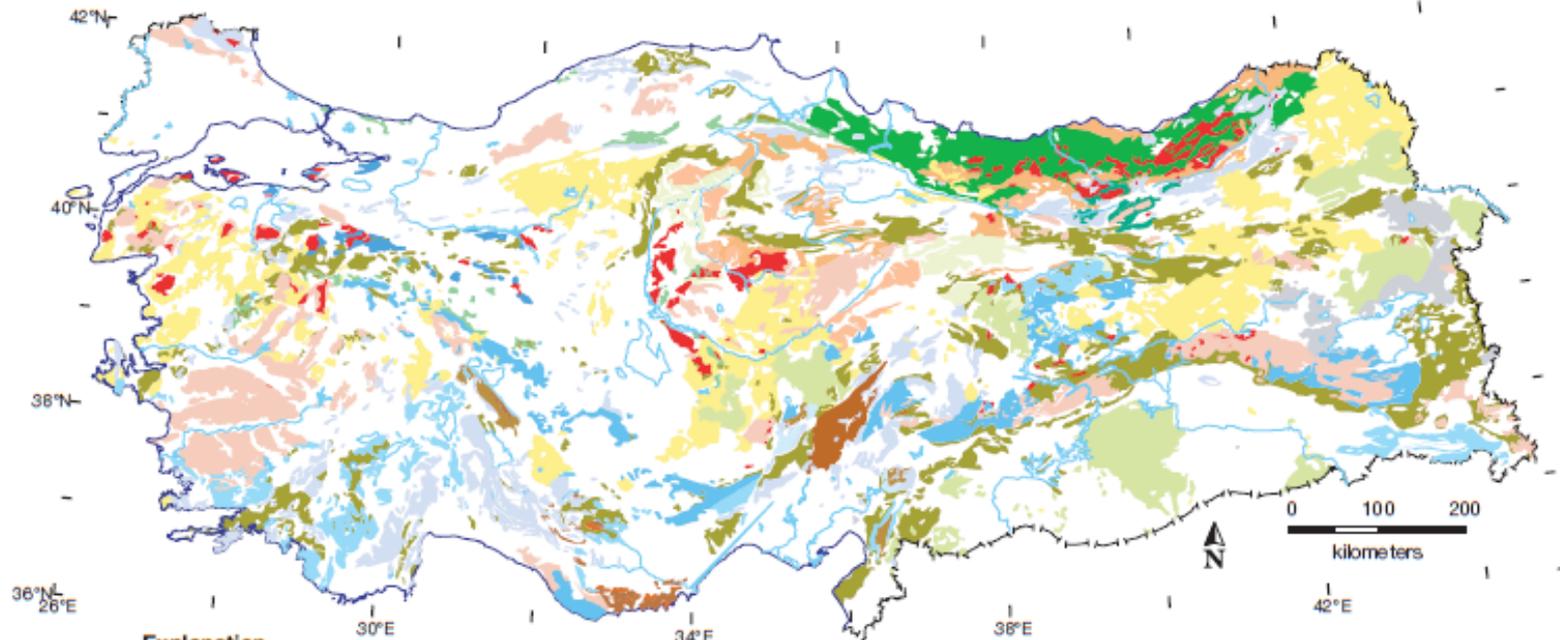
# Structural Geology



# Thrust Ramps



# Stratigraphy



## Explanation

### Submarine Volcanic Rocks

- Eocene
- Upper Cretaceous-Eocene
- Upper Cretaceous
- Jurassic-Cretaceous

### Subaerial Volcanic Rocks

- Quaternary
- Plio-Quaternary
- Tertiary [Mainly Neogene]

### Carbonate Rocks including recrystallized Limestones

- Jurassic-Cretaceous [Mainly] Jurassic
- Triassic-Jurassic
- Mesozoic
- Paleozoic-Mesozoic [Mainly Triassic]
- Permo-Triassic
- Permo-Carboniferous
- Devonian
- Ordovician-Silurian-Devonian-Carboniferous
- Paleozoic

### Acidic to Intermediate Intrusives

- Mesozoic to Miocene [Mainly Tertiary]

### Ophiolite and Ophiolitic Metanges

- Mainly Jurassic-Cretaceous

### Metamorphic Rocks

- Pre-Mesozoic
- Undifferentiated

### Evaporitic Sedimentary Rocks

- Miocene
- Oligo-Miocene

# Deposit styles

Intense tectonism has resulted in a wide variety of deposit types

- Igneous – primary mafic rocks and granitic intrusions
- Sedimentary – recent erosion and older deep water deposits
- Metamorphic – contact and pressure

Tend to get **fields of deposits** rather than a single mega-deposit

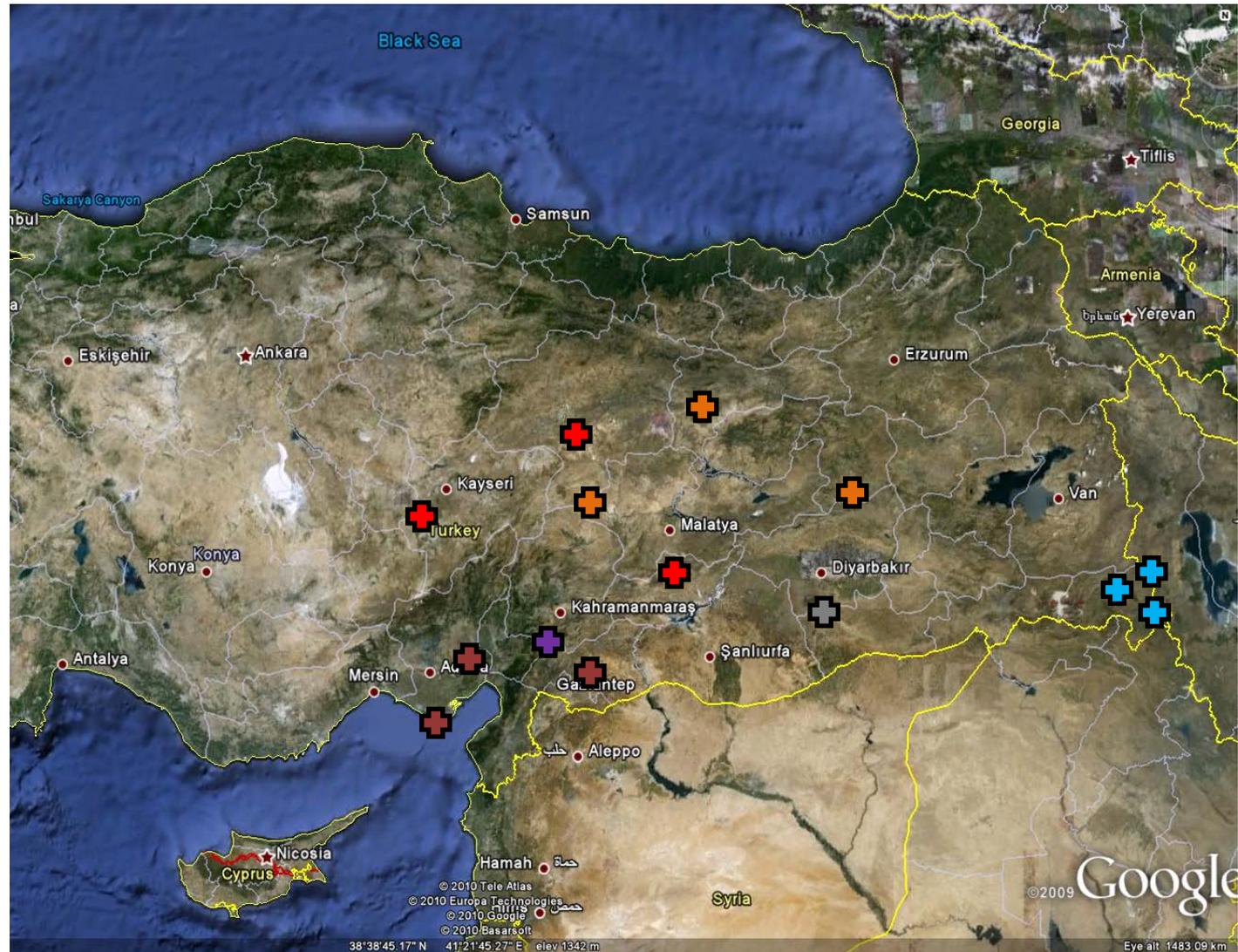
# Minerals

Type	Minerals
Kuroka-type VMS	Cu, Au, Ag, Zn
Cyprus-type VMS	Cu, Au, Ag, Zn
Epithermal	Au, Ag, Cu, Pb, Zn
IOCG	Cu, Au, W
Carbonate hosted	Pb, Zn
Podiform	Cr
Laterite	Ni, Co
Karstic	Bauxite (U??)
Deep water	Mn, Fe
Deltaic	Lignite
Skarn	Fe, Cu

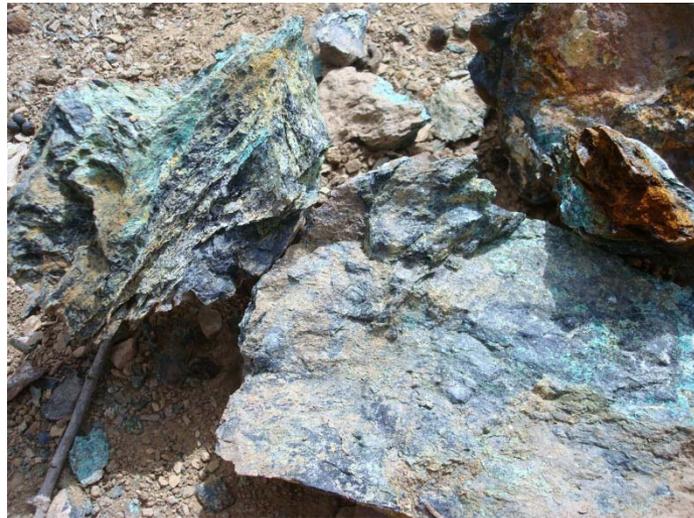
**Plus extensive marble and limestone deposits**

# Some of the fields

- ✚ Copper
- ✚ Iron
- ✚ Manganese
- ✚ Nickel
- ✚ Lead
- ✚ Zinc



# Copper (Bakir)



# Ophiolite copper



# The Joshua Tree



# Sakayra



# Granite hosted copper veins



# In the field



# In the field



# Iron (Demir)



# Malatya



# Our first iron ore



# Lunch?



# Nickel (Nikel)



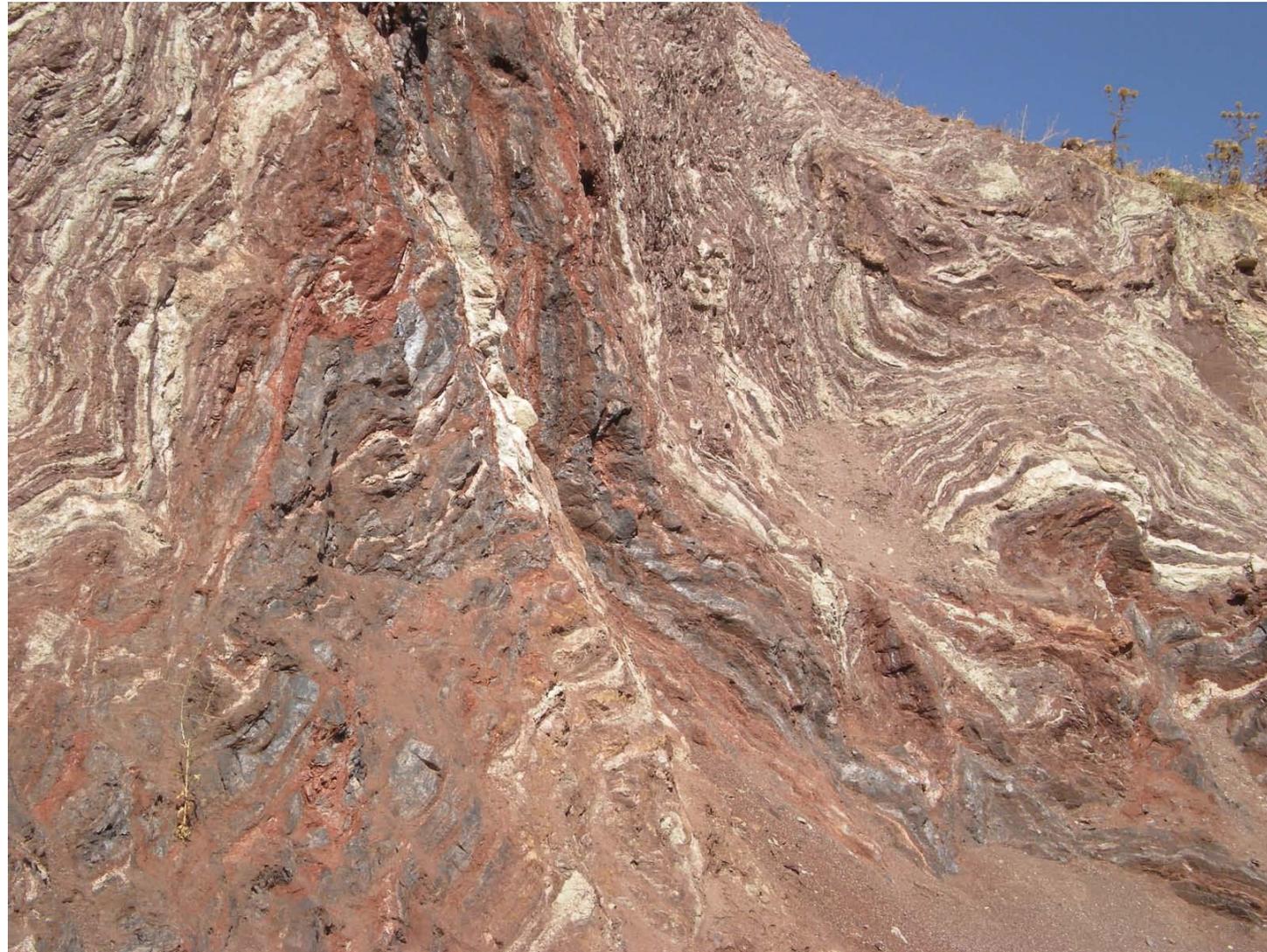
# Cold and wet



# Hot things at the nickel deposit



# Manganese (Mangaan)



# Manganese and grapes



# Village of Sadik



# Manganese at Sadik



# A goat (keci) from Sadik



# Lead (Kursun)



# Heavy peach trees



# Strong enough for the fruit?



# Hakkari Zinc (chinco)



# Oxidised zinc



# Beautiful spring rivers



# Winter snow



# Hemimorphite



# In the field



# Geological Legends



# A hot day



# Chilling Out



# A Real Legend



# Acknowledgements

This work was performed whilst working for and later consulting to Red Crescent Resources

It is really fantastic to share this geological experience

And of course the time with the legends!