The Ø 160 km “Salerno Crater“ (Italy)

- RAMAN Spectra of selected Rock Samples - by Harry K. Hahn, 30.6.2021 -

Summary :

Raman spectra of quartz samples collected at sample site **21** near Ascea on the west-coast of Italy (near Sapri) provide first indication for the Ø 160 km Salerno Impact Crater described in my hypothesis

The yet unknown **Ø 160 km “Salerno Crater“** belongs to a larger Secondary Impact Crater Chain, which was caused by impacting ejecta material that was ejected by the Ø 1270 x 950 km Permian Triassic Impact Crater (PTI), located in the Arctic Sea near Alaska, according to my hypothesis.

(→ weblink to my Permian Triassic Impact Hypothesis : → **Part 1** (**P1**), **Part 2** (**P2**) of my hypothesis)

The samples which I collected to proof the “Salerno Crater“ did not provide the same clear evidence for a secondary impact crater, as for example the samples from Cabo de Creus in Spain, which provided solid evidence for the **130 x 110 km „Bay-of-Lyon Impact Crater“** (Link2) , that belongs to the same Secondary Impact Crater Chain as the “Salerno Crater“, caused by the PT Impact-Event.
But the Raman spectra of quartz from sample site **21** at least provide first indication for a shock event.

The shifts of the main Raman bands (peaks) to the lower frequencies **261, 204** and **125 cm^{-1}** (Stone 1) and to **260** and **205 cm^{-1}** (Stone 2) which are visible in the Raman Spectra of these quartz-samples from sample site **21** at least give a first indication that the quartz was exposed to a **shock pressure in the range of 20 - 22 GPa**. The shock pressure probably was just below the treshold of 22 GPa so that the main quartz line at 464 didn’t shift to a lower frequency (→see explanation in the Appendix at page **28**)

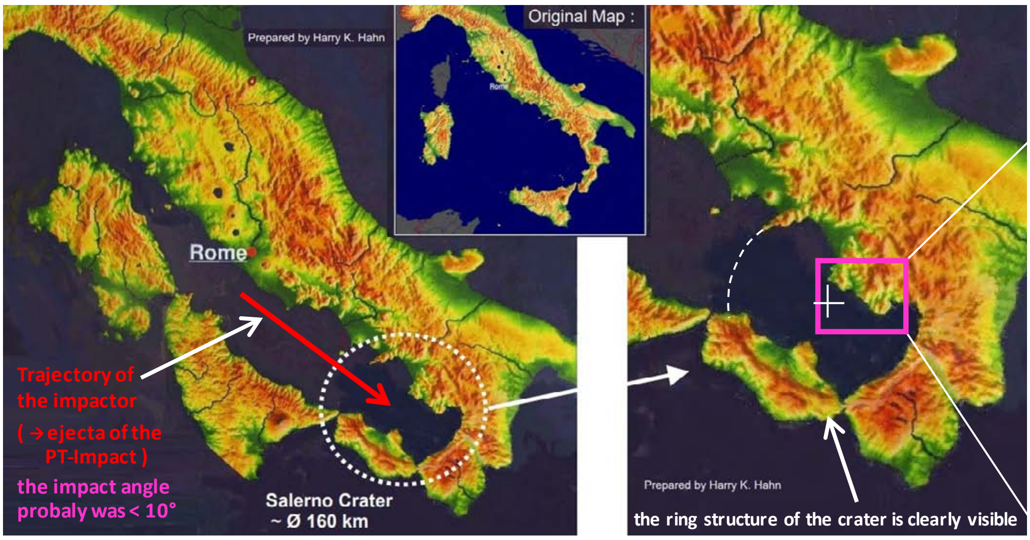
Quartz in the samples from the sample site **20** also show shifts in one or two of the main Raman bands (peaks) to the lower frequencies **263** and **205 cm^{-1}**. The microscopic images of some of the analysed quartz grains in samples from site **21** & **20** may provide further proof for a shock event caused by an impact (see **page 5 & 6**). The images show complex micro-fracture-patterns in the analysed quartz grains
The spectra were made with a **BRUKER Senterra-II Raman Microscope** (wavenumber precision <0.1cm^{-1})

In order to really verify the sample sites **20** and **21** as sites which were effected by an impact event and which are part of the described “Salerno Crater“ clear shock-metamorphic effects must be discovered in the rocks of these sample sites. This can be done with the help of PDFs (planar deformation features) However this requires careful preparation of the samples and experience in PDF-analysis.

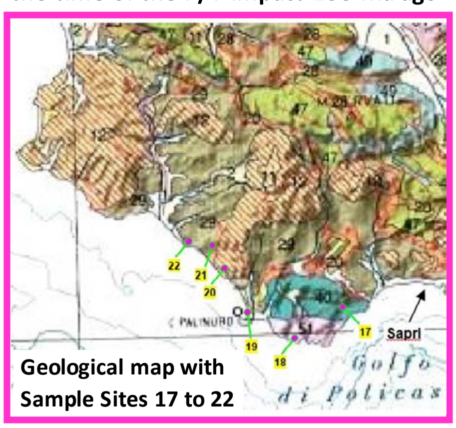
Therefore I want to ask scientists who read my studies to organize a professional analysis of samples from the center-area of the “Salerno Crater“ in order to proof it as a secondary crater of the Permian Triassic Impact Event as described in my hypothesis.

A shock pressure of 20 GPa far exceeds every pressure caused by normal terrestrial metamorphism. The indicated shock pressure of ≈20 GPa is lower than the shock pressure that occured in other large impact craters on Earth. This indicates that the “Salerno Crater“ was caused by an oblique impact, and that the impactor which formed the crater (→ejecta of the PT-Crater) impacted with low velocity <8 km/s

→ Images of the analysed rock samples and photos of the sample sites are in the Appendix at **page 24**.
→ A general summary to all analysed sample sites is provided by **Part 6** (**P6**) of my **PTI-hypothesis** (**P1**)
→ More images of all sample sites are available on www.permiantriassic.de or www.permiantriassic.at

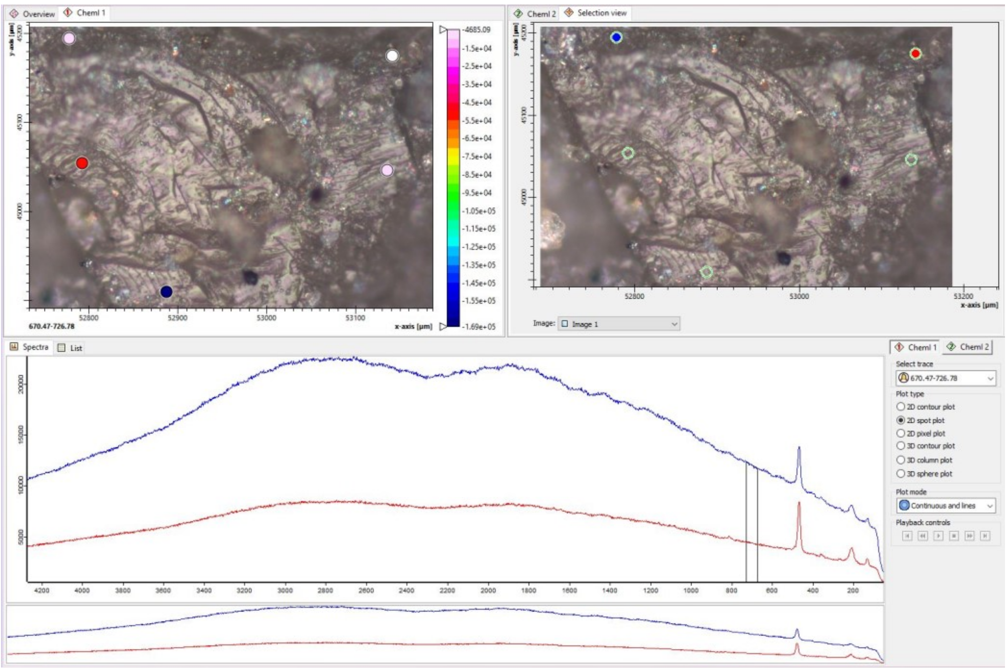


The manipulated topographic map on the left shows the probable position of the crust fragments which form Italy at the time of the P/T-Impact 253 Ma ago

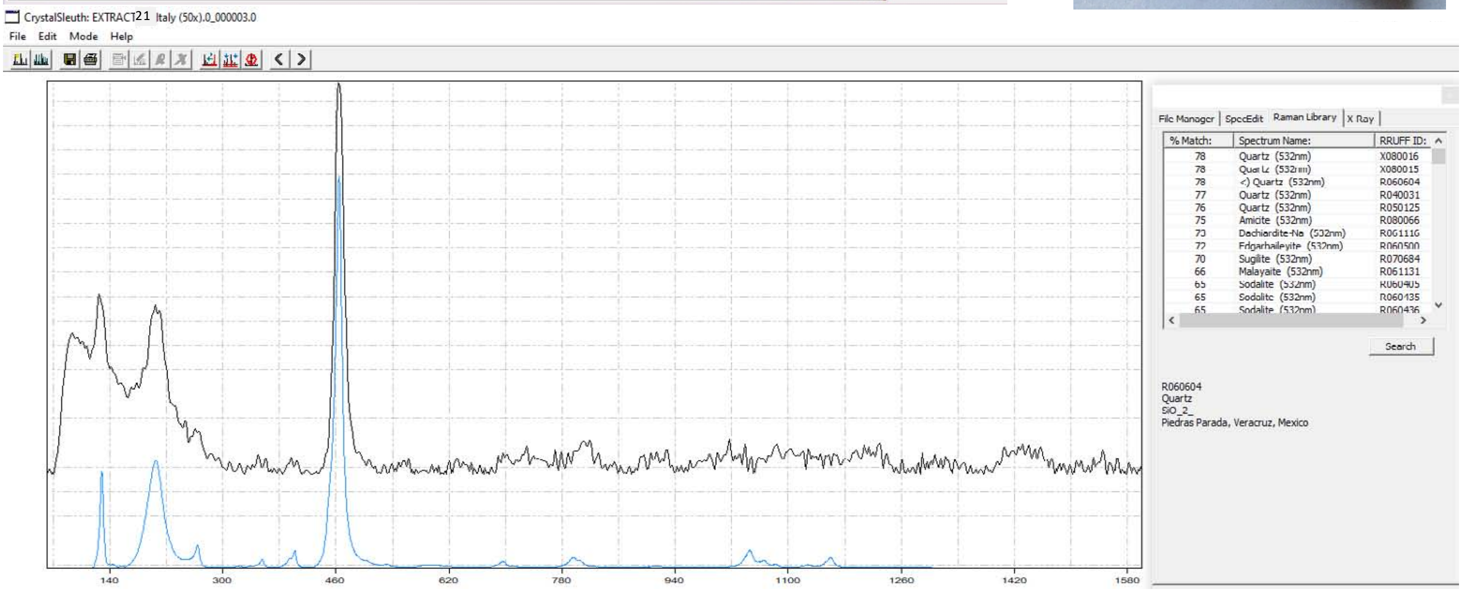


Geological map with Sample Sites 17 to 22

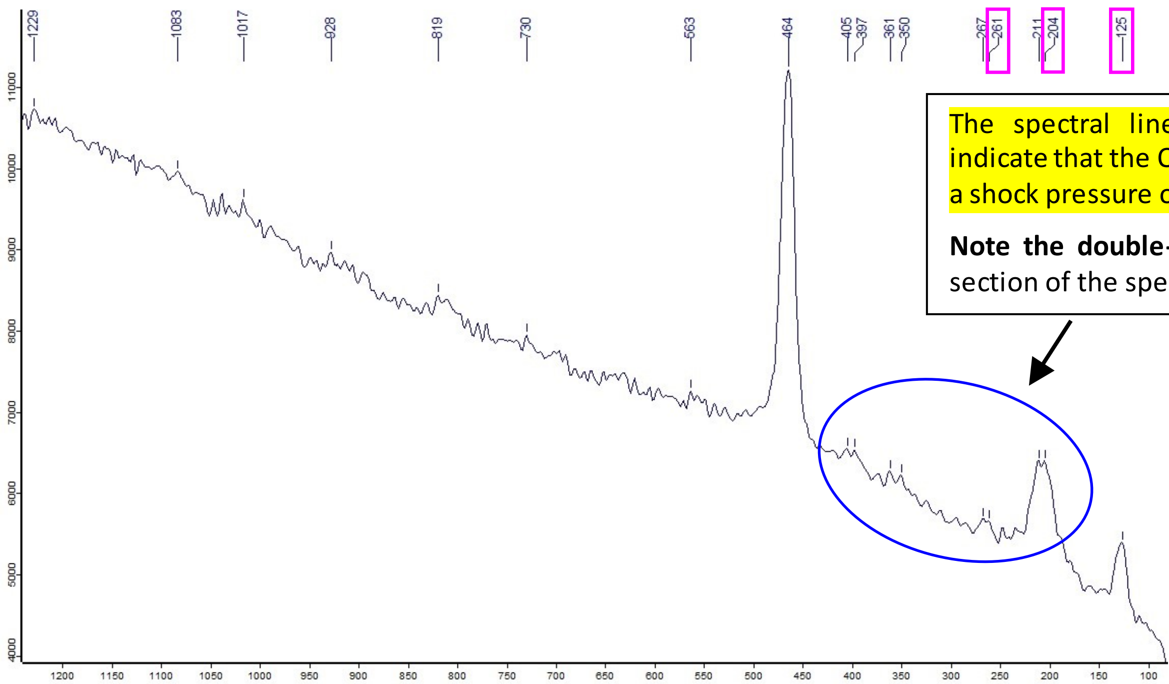
Sample Site 21 : Stone 1_spectra 1 indicates : Quartz (→ see RRUFF_CS results)



Sample :



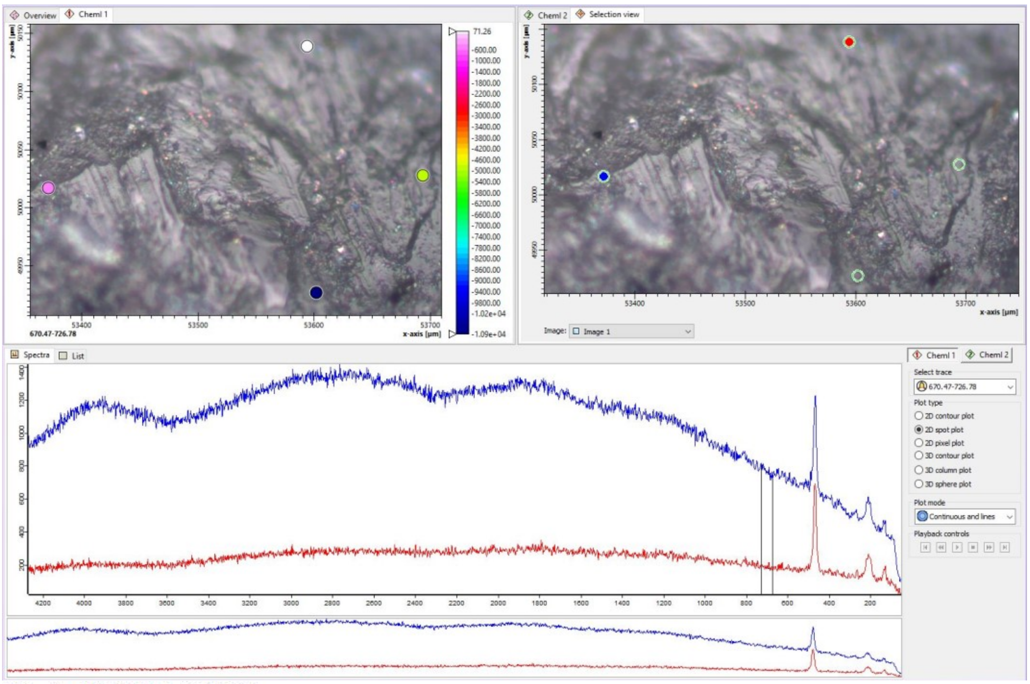
Indication for a shock event are the shifts of the marked Quartz spectral lines towards 261, 204 and 125



The spectral lines 261, 204 and 125 indicate that the Quartz was exposed to a shock pressure of around **20 - 22 GPa**.

Note the double-peaks in the marked section of the spectrum.

Sample-Site 21 : Stone 2_spectra 1 indicates : Quartz (→ see RRUFF_CS results)



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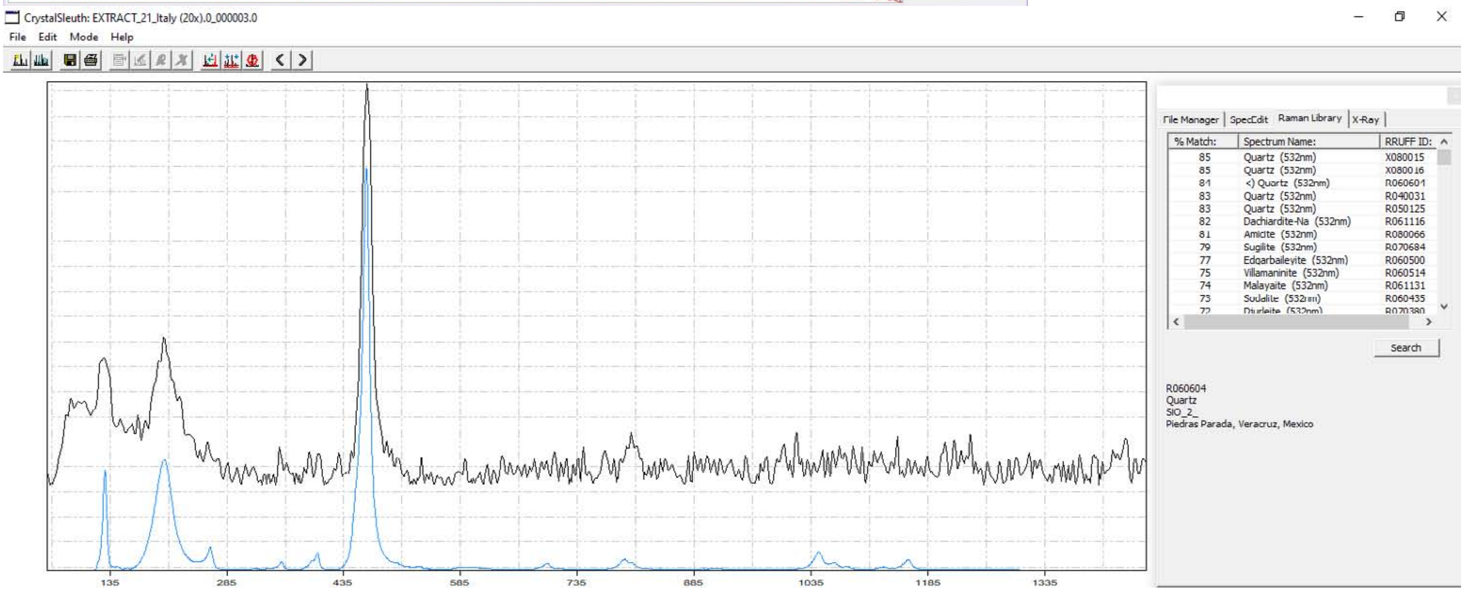
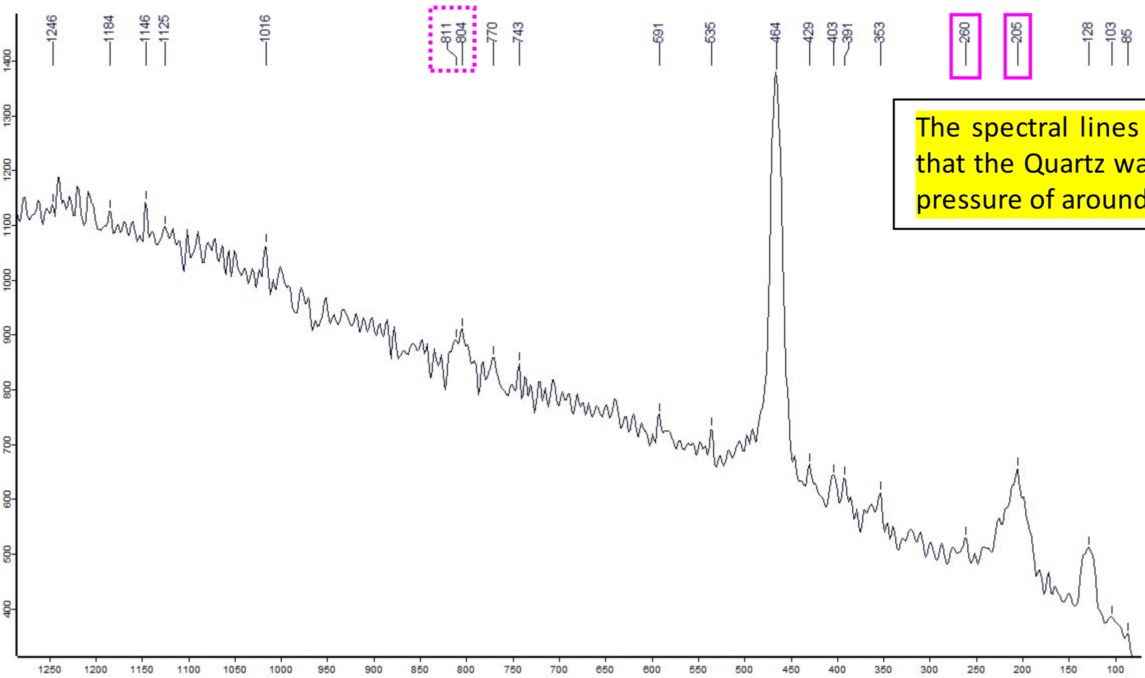
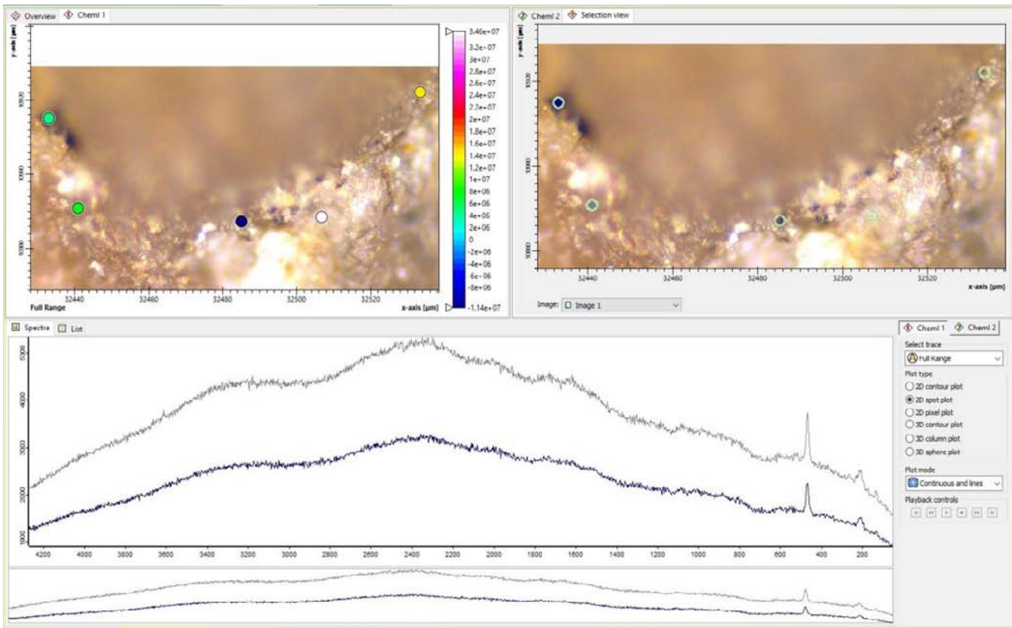


Indication for a shock event are the shifts of the marked Quartz spectral lines towards 260 and 205

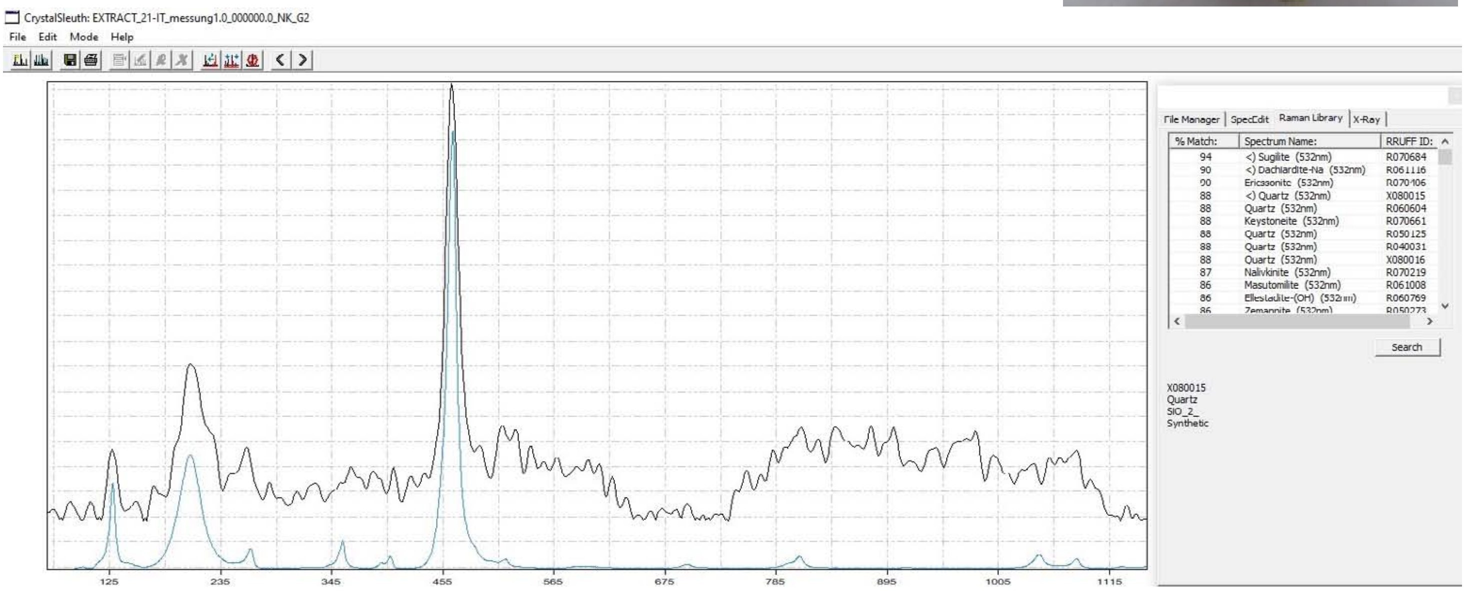


The spectral lines 260 and 205 indicate that the Quartz was exposed to a shock pressure of around **20 - 22 GPa**.

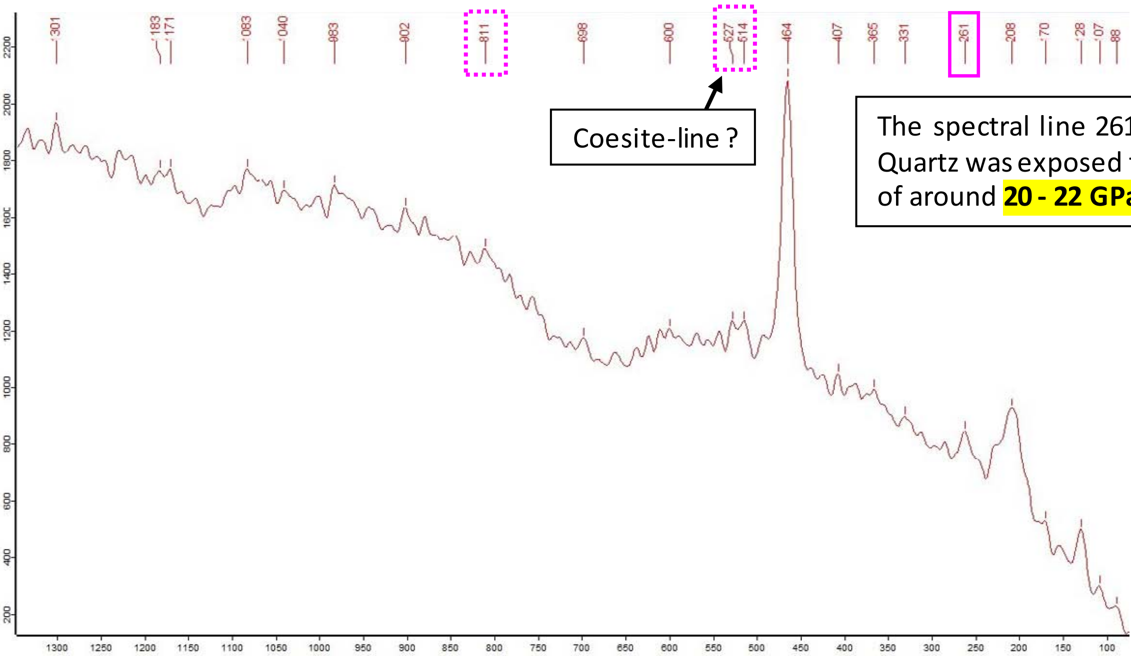
Sample Site 21 : Stone 2_spectra 2 indicates : Quartz (→ see RRUFF_CS results)



Sample :



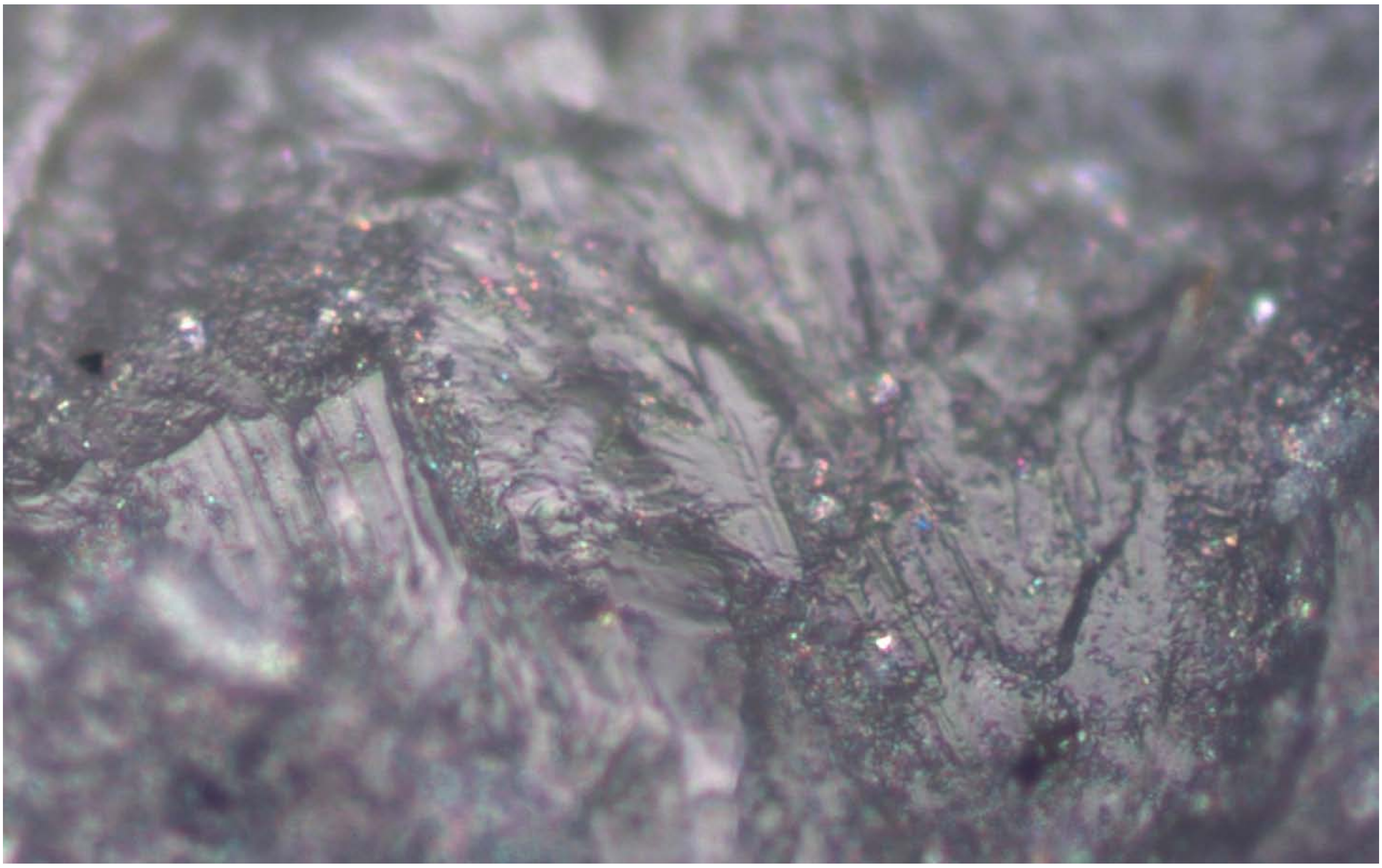
Indication for a shock event is the shift of the marked Quartz spectral line towards 261



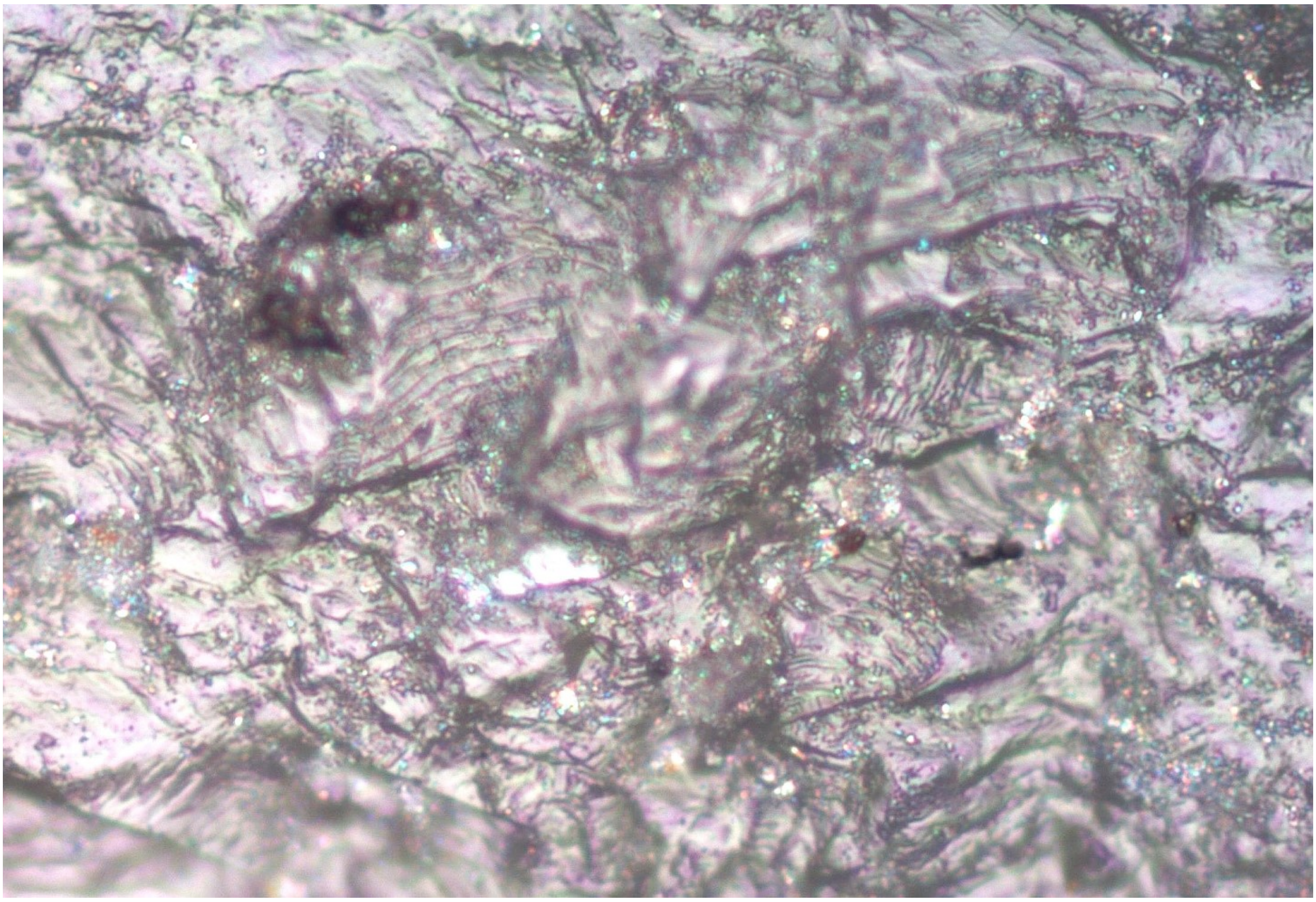
The spectral line 261 indicates that the Quartz was exposed to a shock pressure of around **20 - 22 GPa**.

Microscopic Images : Sample from Site 21 → original state (no preparation for analysis)

Sample Site 21 : Stone 2_spectra 1 : Quartz - Image size : ~ 400 x 250 µm

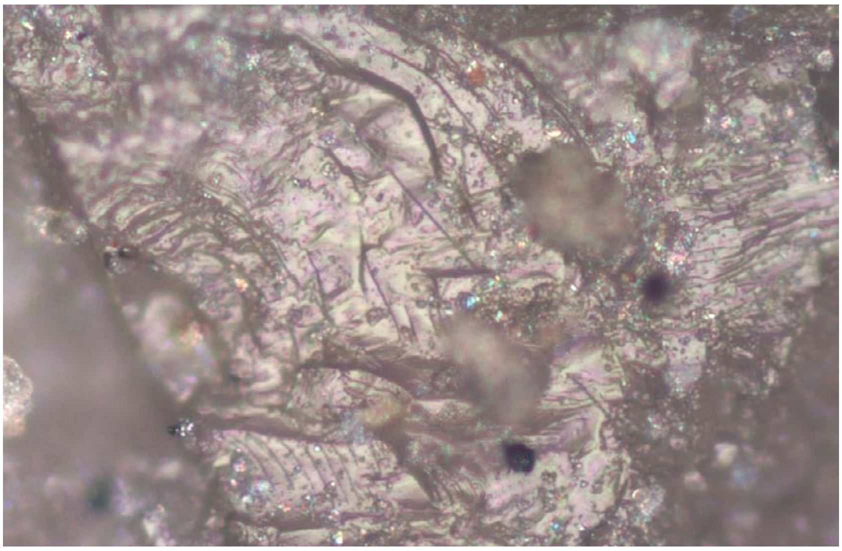


Sample Site 21 : Stone 2 : Quartz - Image size : ~ 400 x 300 µm

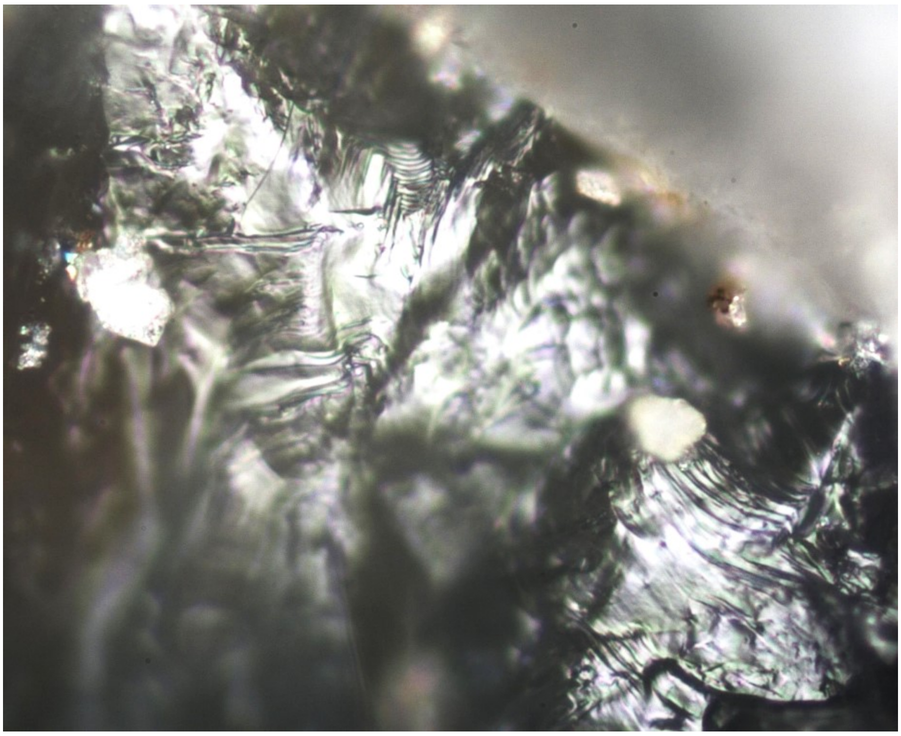


Microscopic Images : Sample from Site 21 → original state (no preparation for analysis)

Sample Site 21 : Stone 1_spectra 1 : Quartz - Image size : ~ 400 x 300 µm

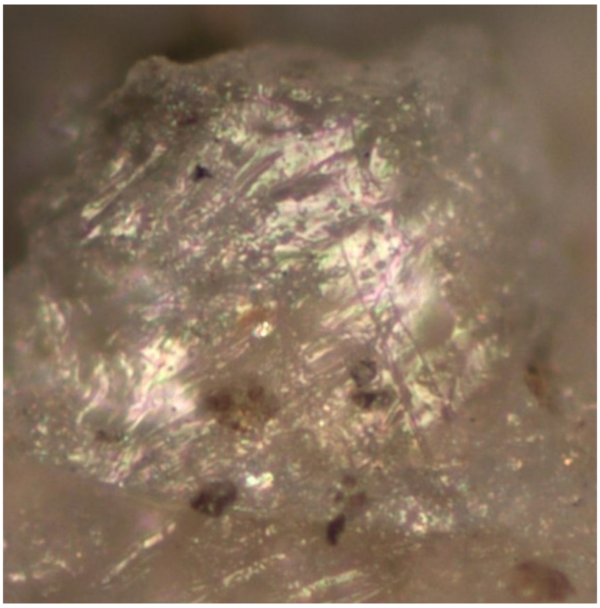


Sample Site 21 : Stone 1_spectra 2 : Quartz - Image size : ~ 250 x 200 µm



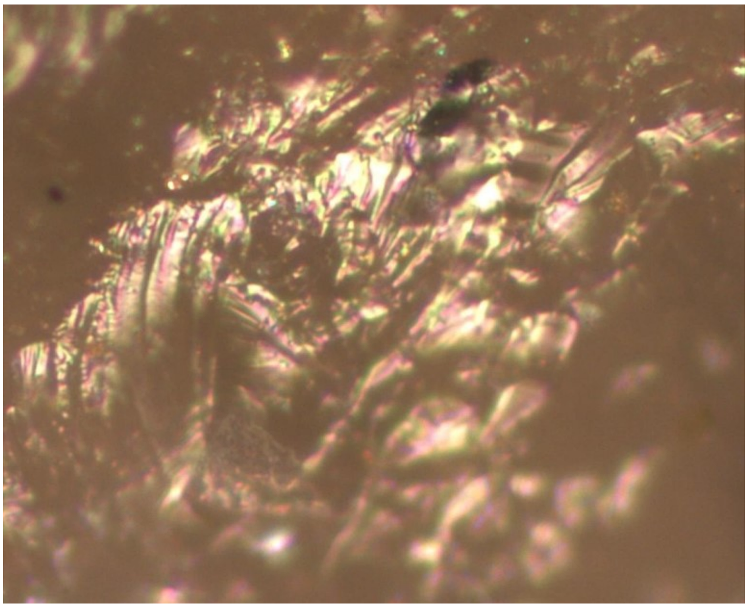
Sample Site 21 : Stone 1 : Quartz

Image size : ~ 200 x 180 µm

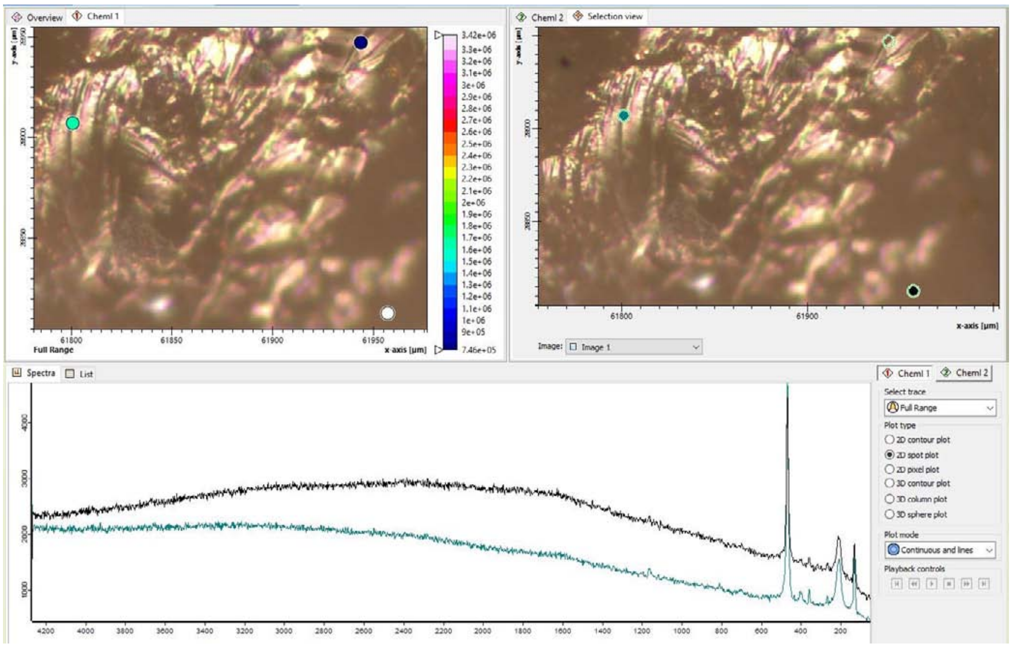


Sample Site 21 : Stone 3 : Quartz

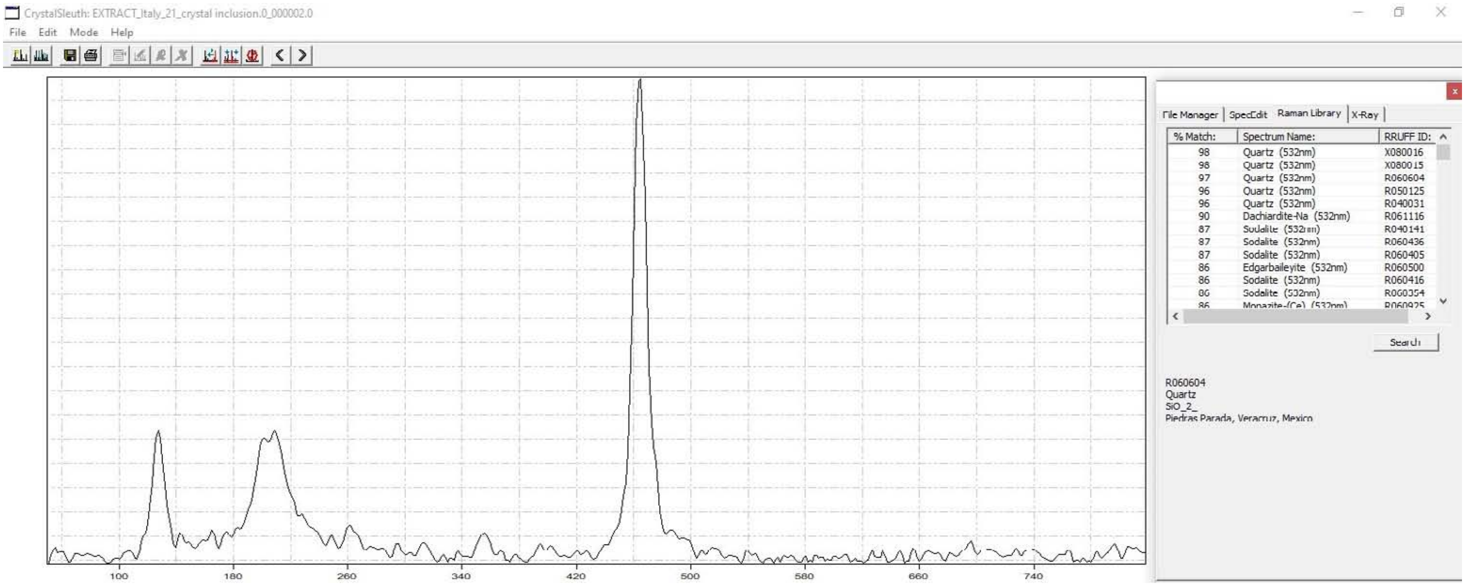
Image size : ~ 220 x 200 µm



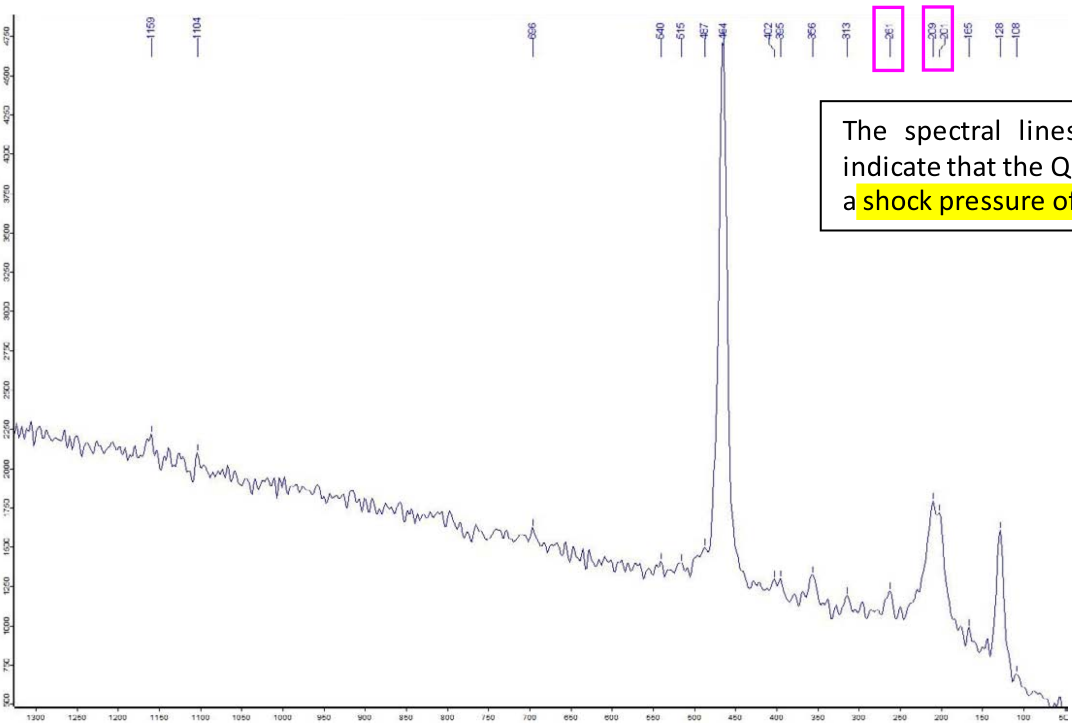
Sample-Site 21 : Stone 3_spectra 1 (crystal inclusion) indicates : Quartz (→ see RRUFF_CS results)



Sample :



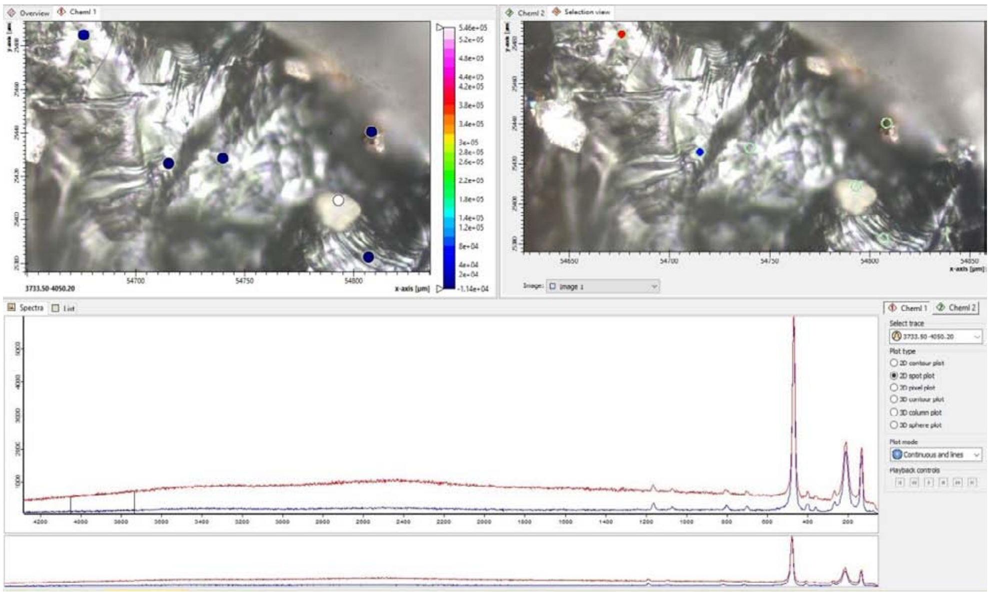
Indication for a shock event are the shifts of the marked Quartz spectral lines towards 261 and 201 (209)



The spectral lines 261 and 201 (209) indicate that the Quartz was exposed to a **shock pressure of around 20 - 22 GPa**.

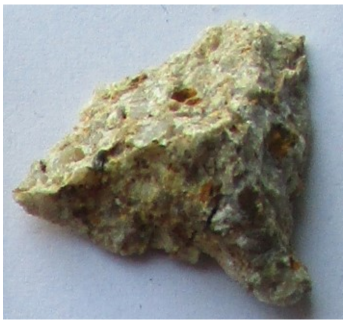
Sample Site 21 : Stone 1_spectra 2 indicates : Quartz Sugilite , Dachiardite-Na (→ see RRUFF_CS results)

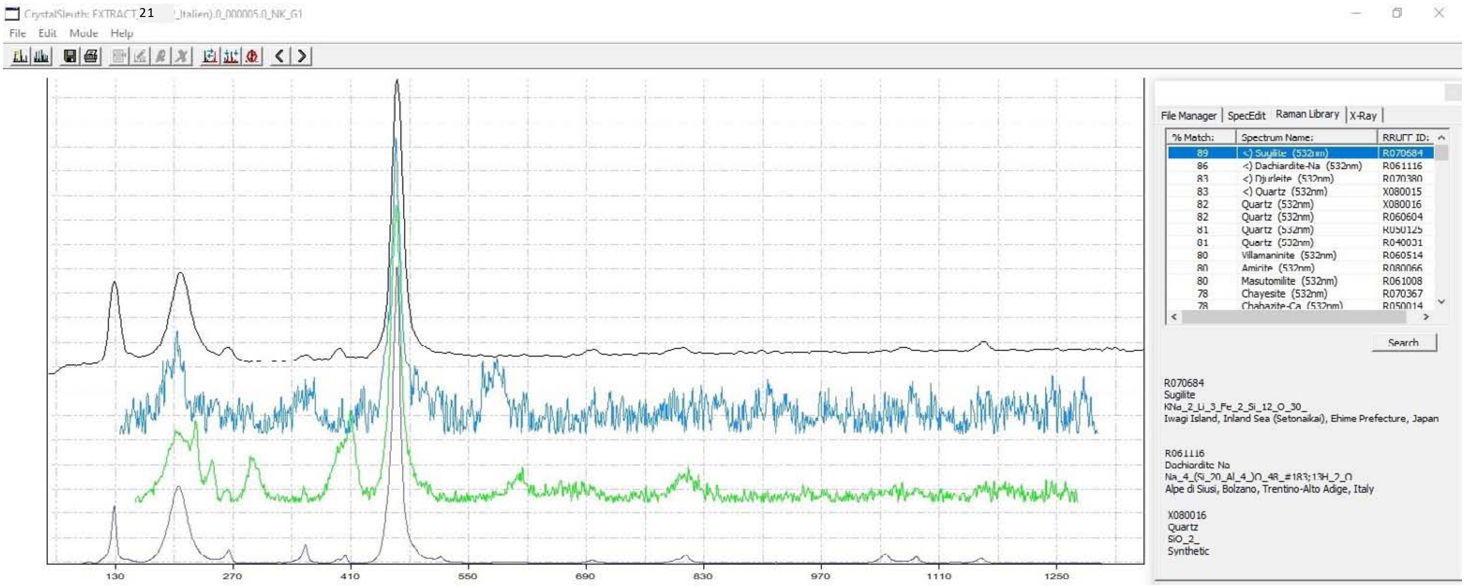
The spectral lines indicate that **Quartz** is the most probable mineral measured in this spectral analysis

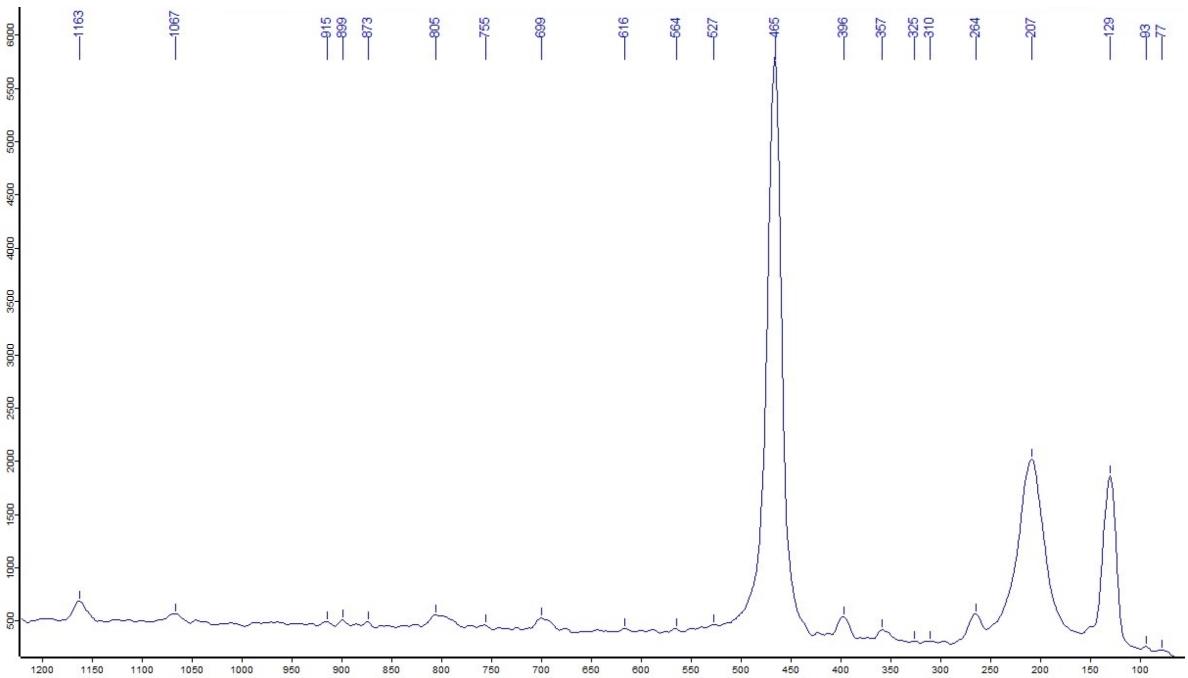


Note the fracture patterns on the microscopic image.

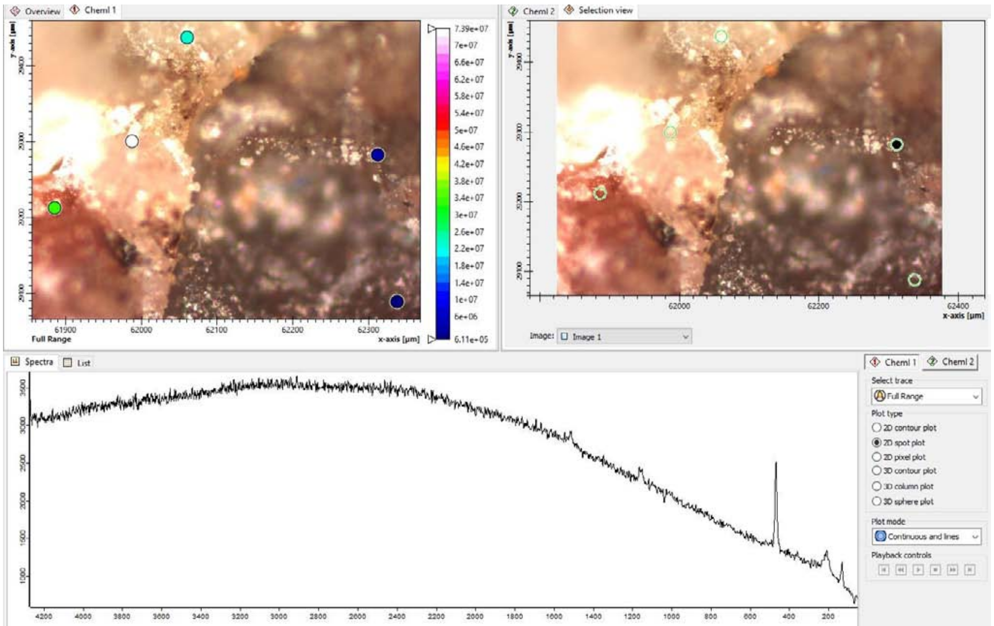
Sample :



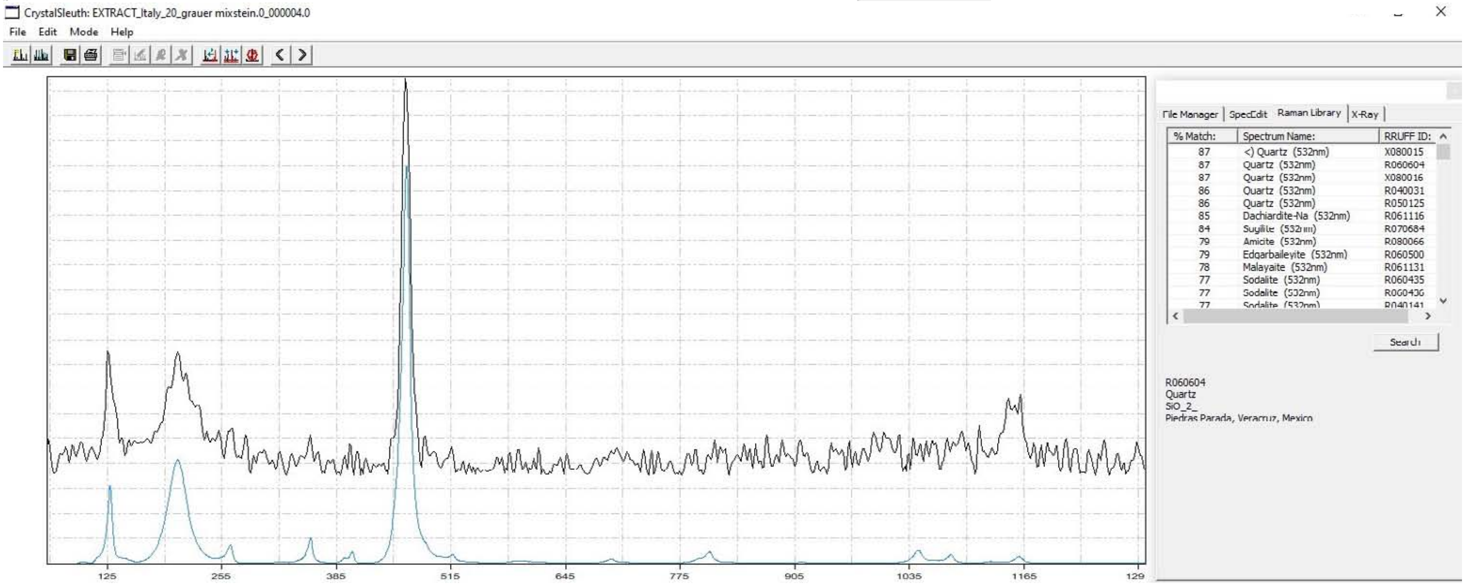




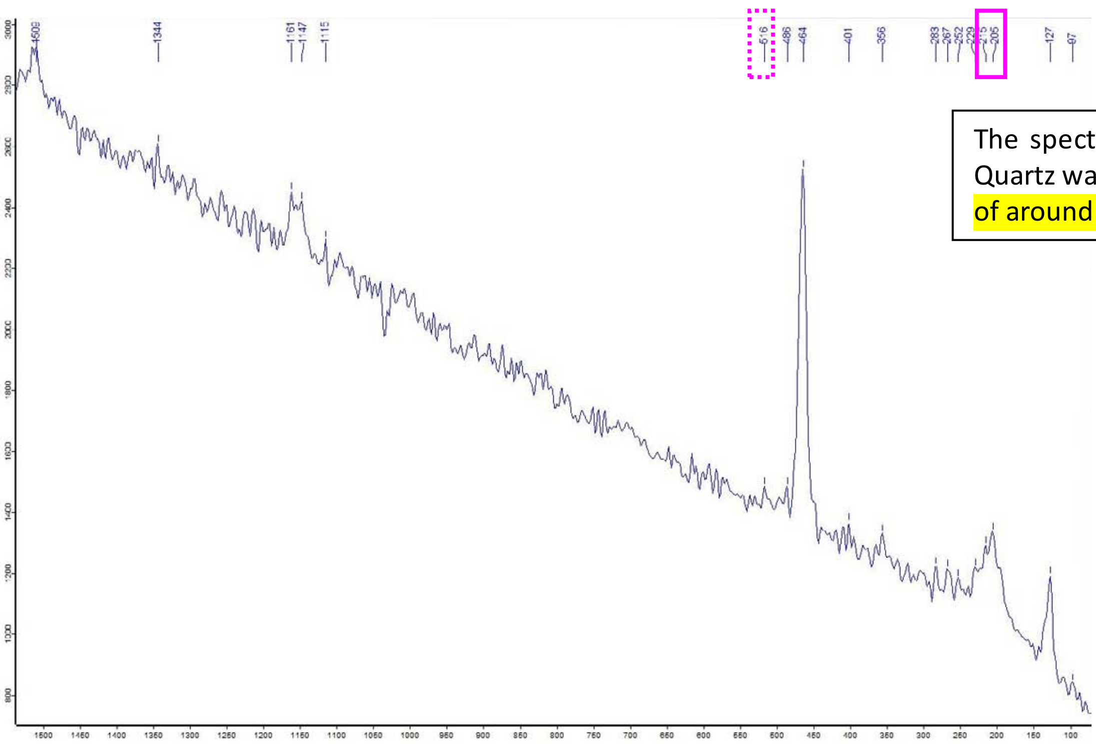
Sample Site 20 : Stone 4_spectra 1 indicates : Quartz (→ see RRUFF_CS results)



Sample :

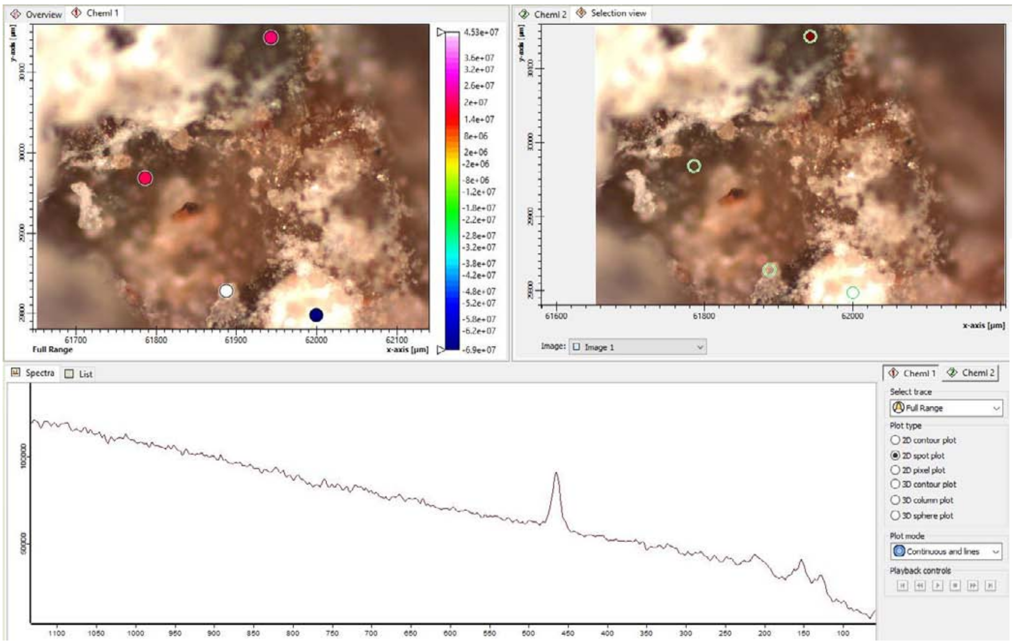


Indication for a shock event is the shift of the marked Quartz spectral lines towards 205



The spectral line 205 indicates that the Quartz was exposed to a shock pressure of around **20 – 22 GPa**.

Sample Site 20 : Stone 5_spectra 1 indicates : Quartz (→ see RRUFF_CS results)



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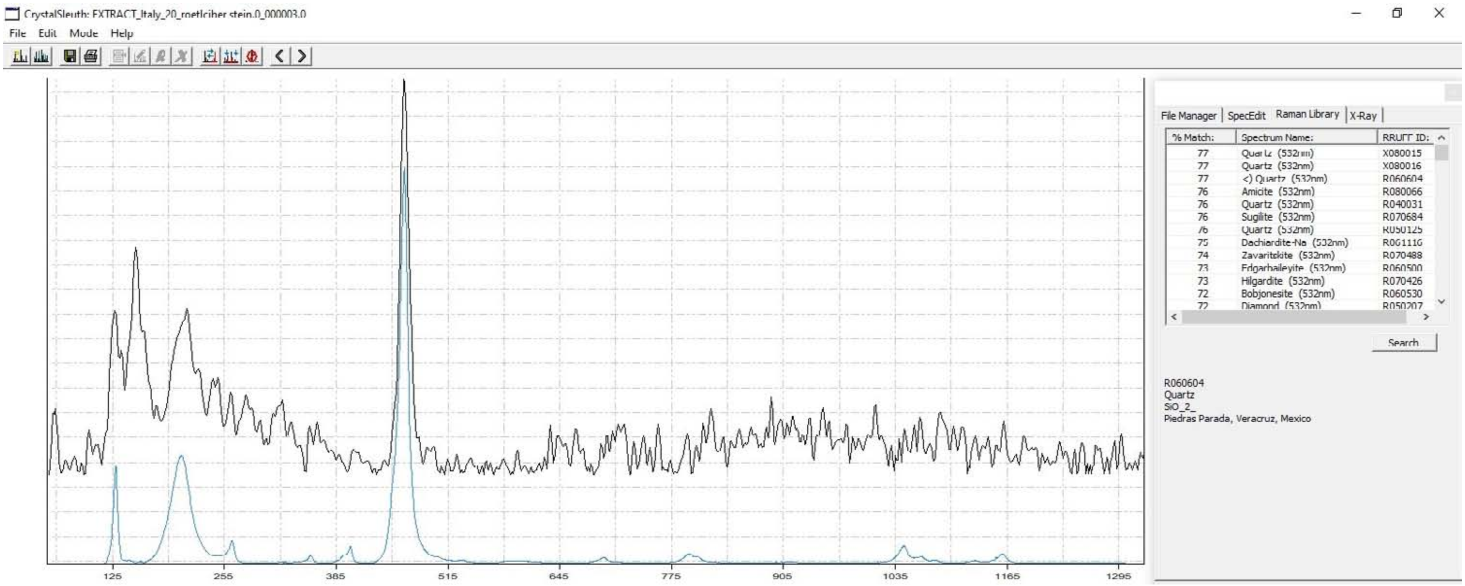
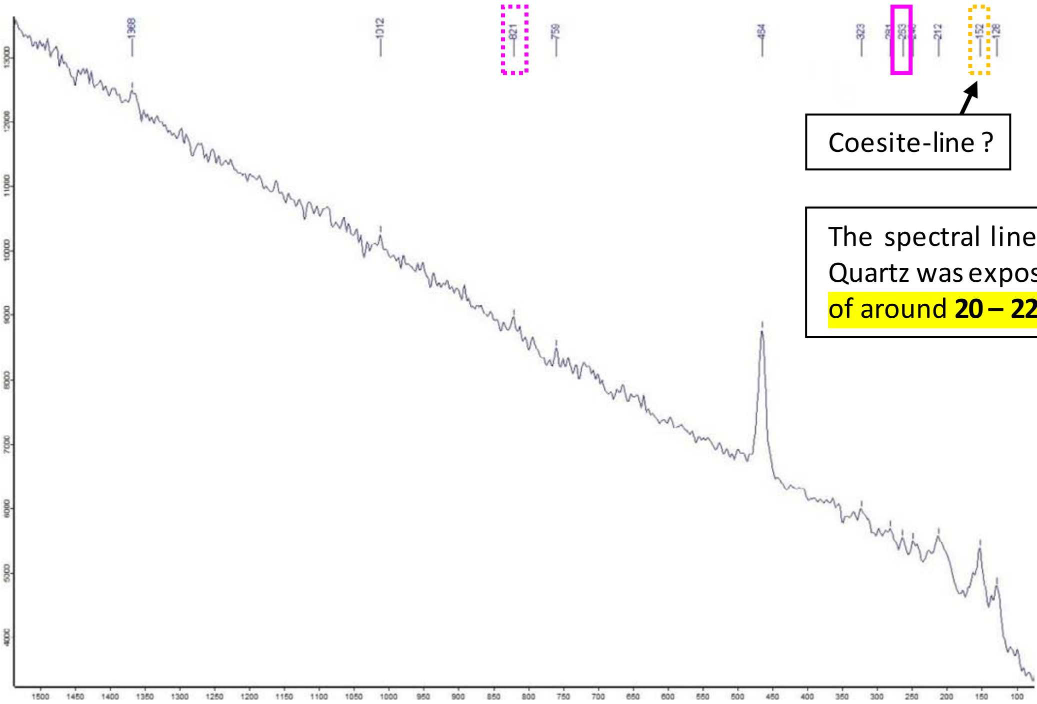


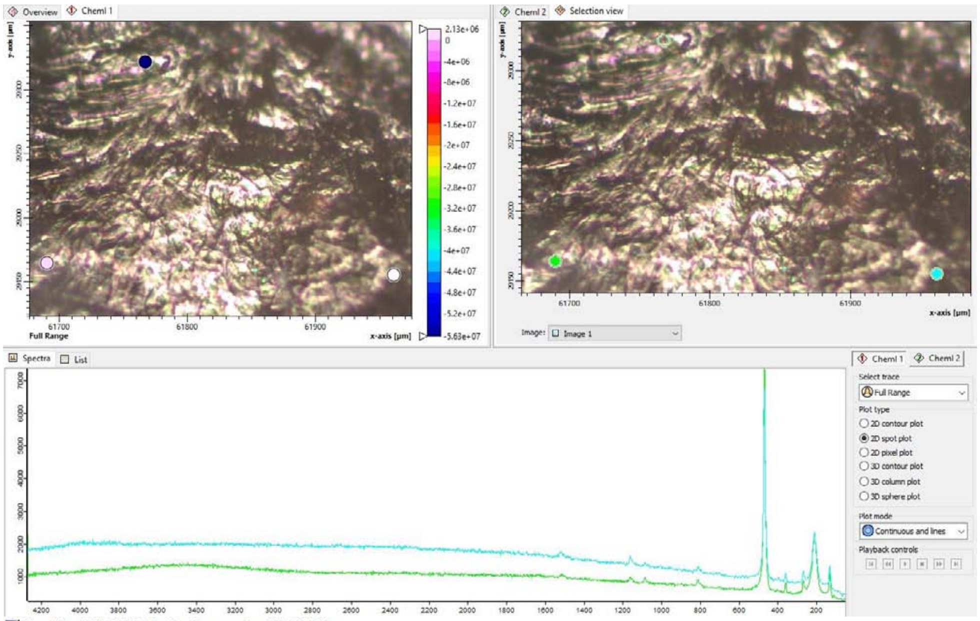
Indication for a shock event is the shift of the marked Quartz spectral lines towards 263



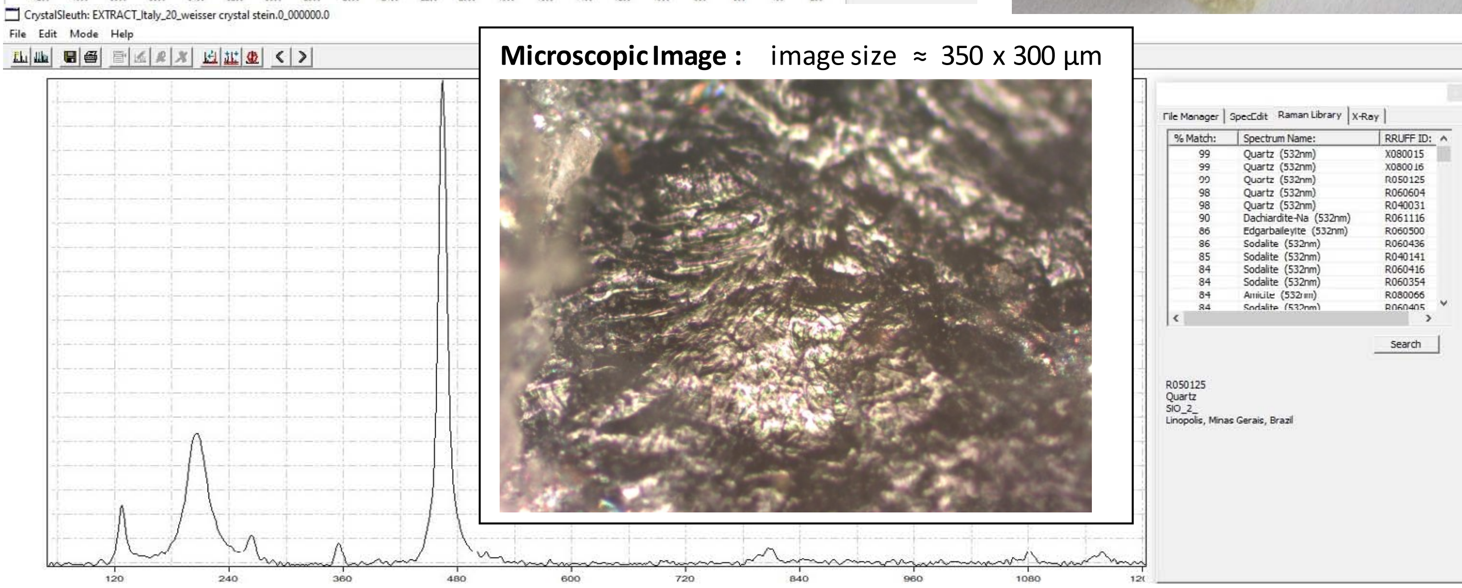
Coesite-line ?

The spectral line 263 indicates that the Quartz was exposed to a shock pressure of around **20 – 22 GPa**.

Sample Site 20 : Stone 6_spectra 1 indicates : Quartz (→ see RRUFF_CS results)

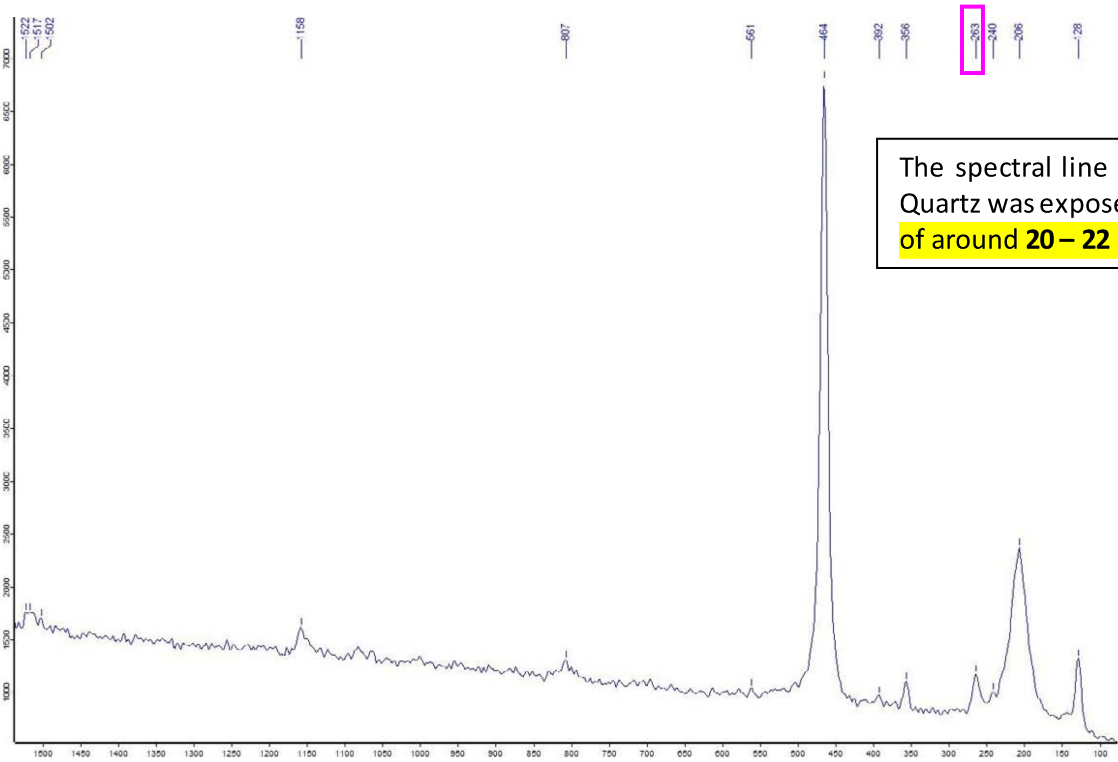


Sample :



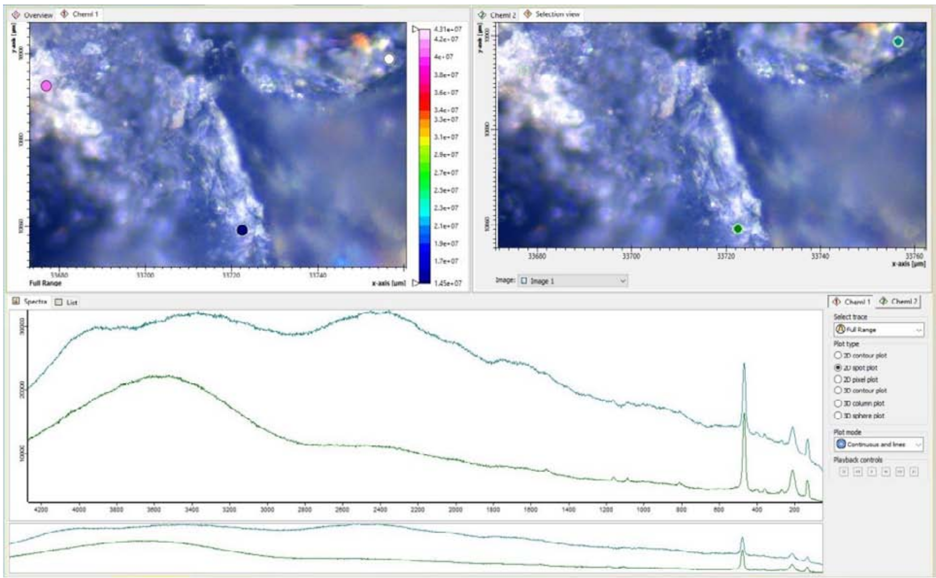
Microscopic Image : image size ≈ 350 x 300 µm

Indication for a shock event is the shift of the marked Quartz spectral lines towards 263

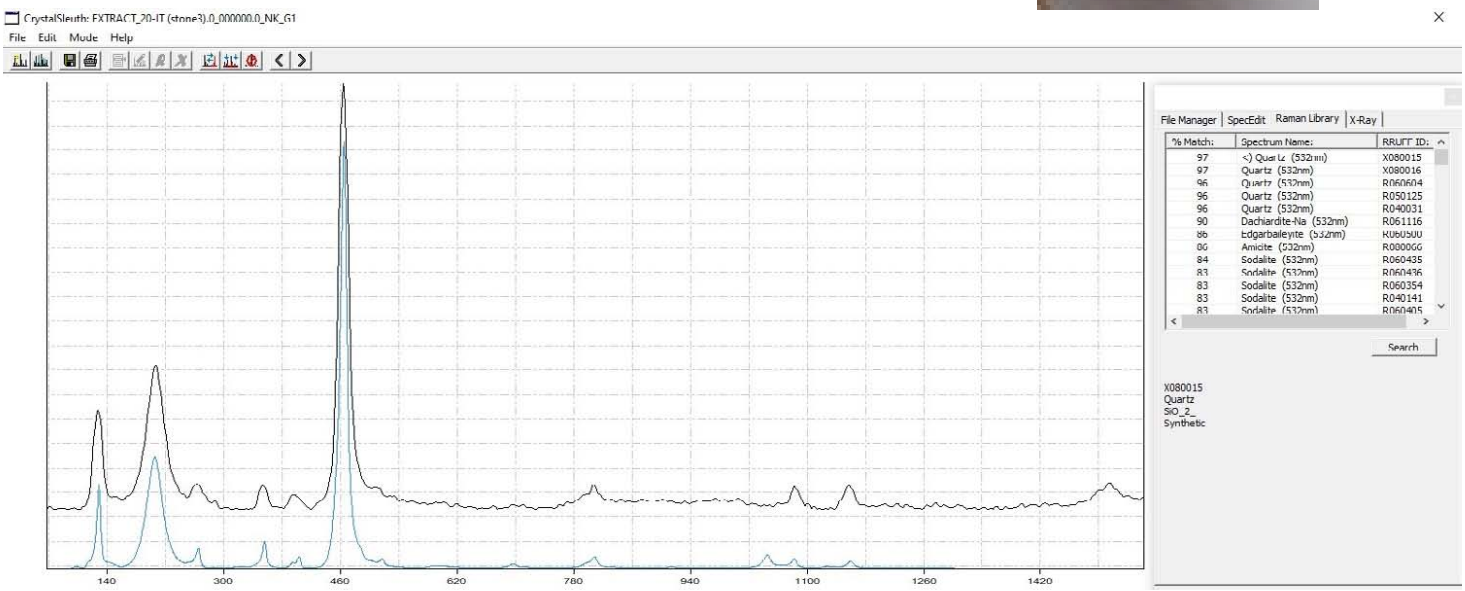


The spectral line 263 indicates that the Quartz was exposed to a shock pressure of around **20 – 22 GPa**.

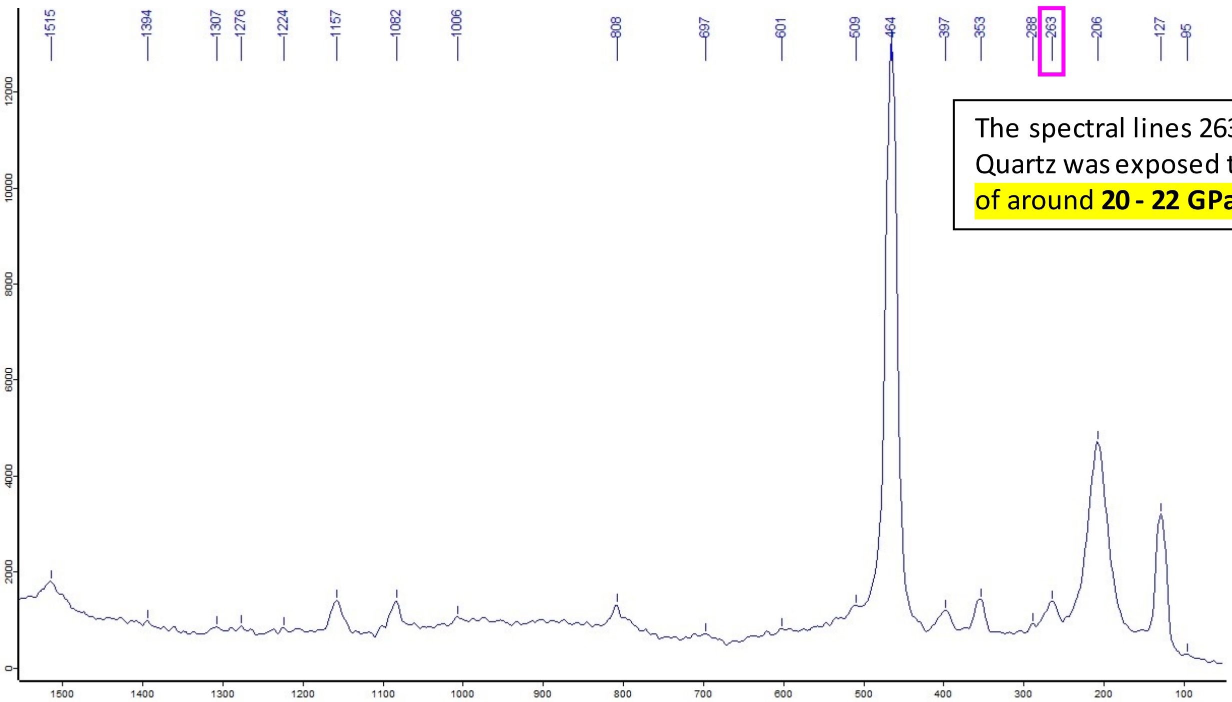
Sample Site 20 : Stone 3_spectra 1 indicates : Quartz (→ see RRUFF_CS results)



Sample :



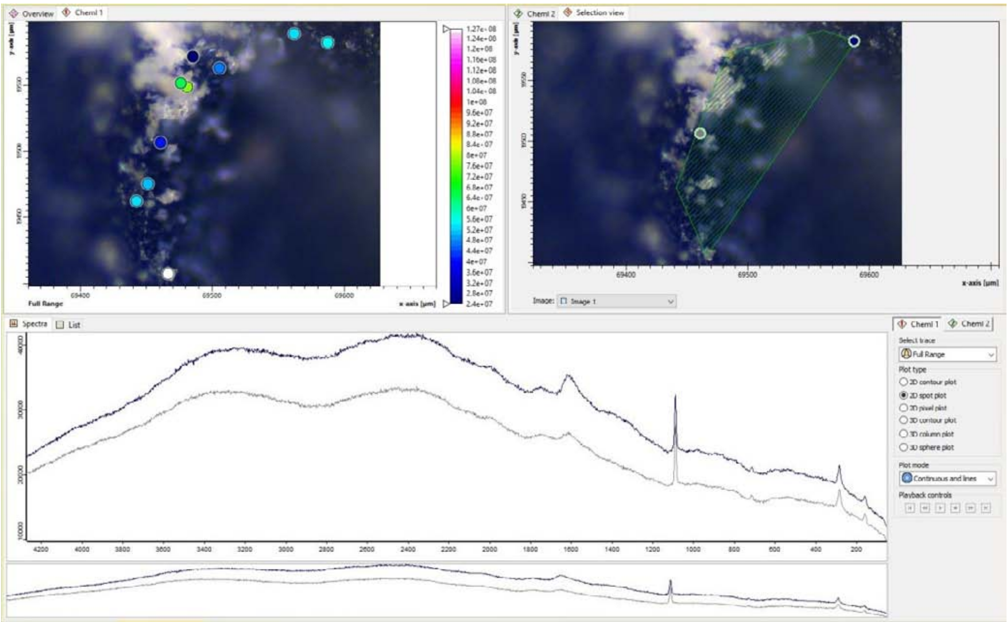
Indication for a shock event is the shift of the marked Quartz spectral lines towards 263



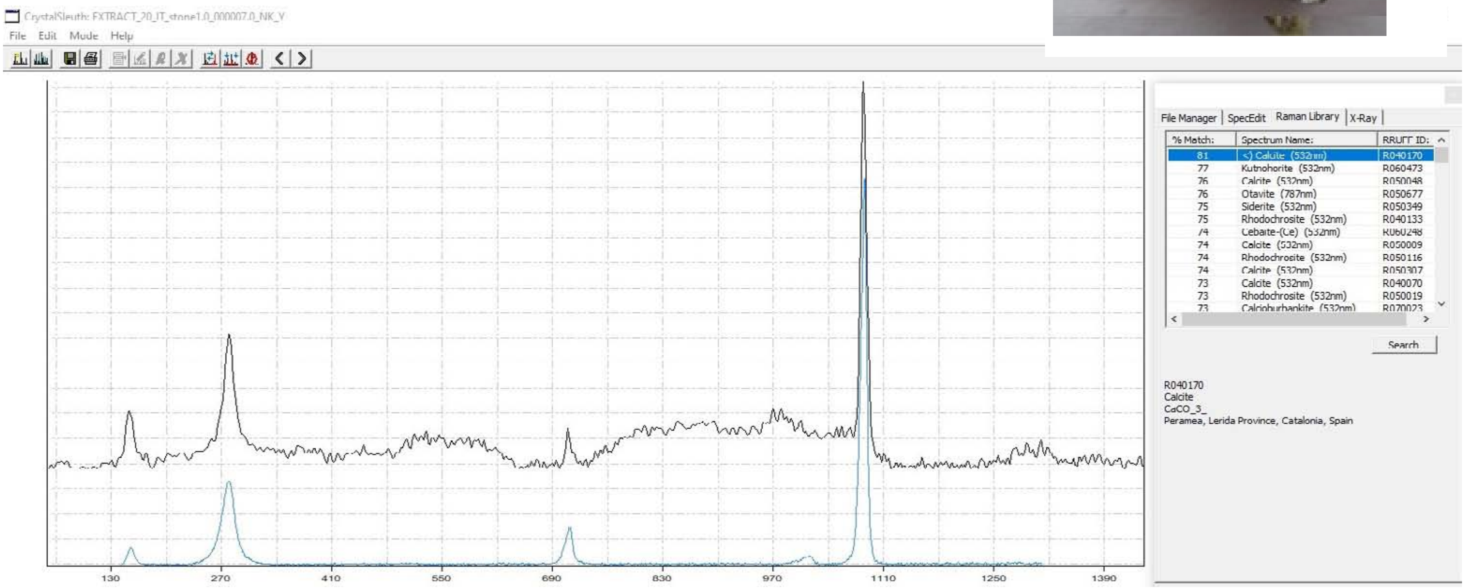
The spectral lines 263 indicates that the Quartz was exposed to a shock pressure of around **20 - 22 GPa**.

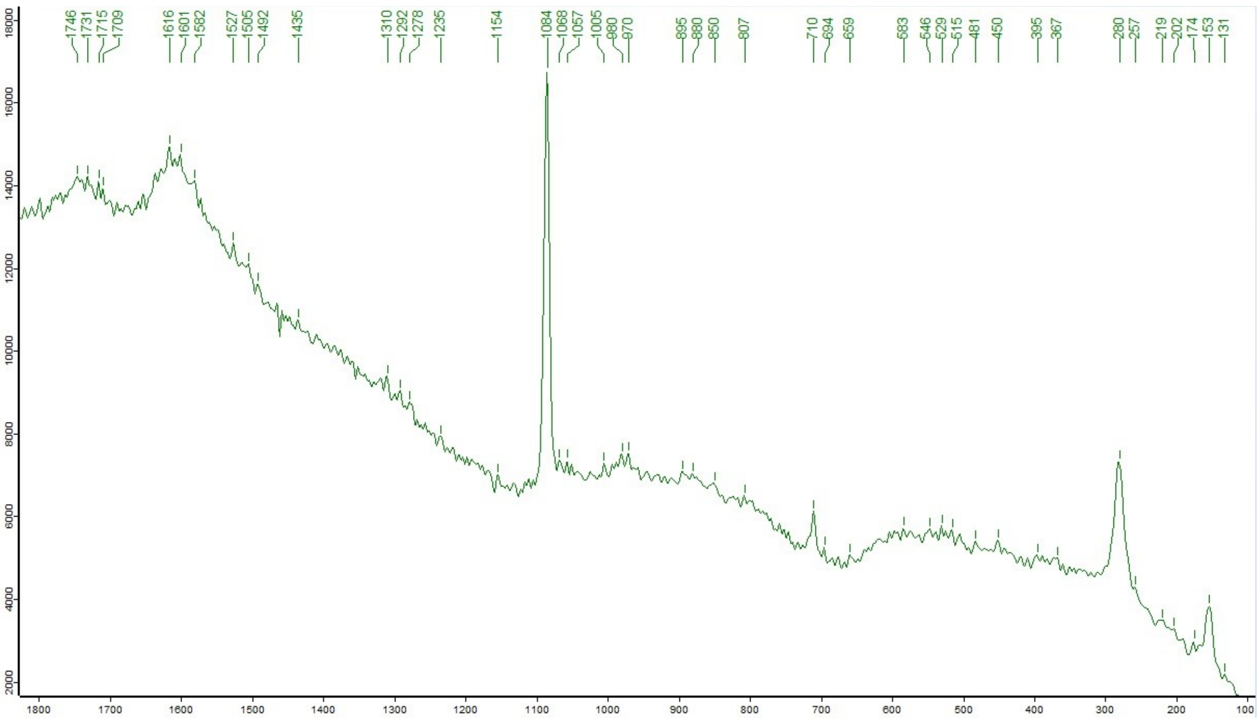
OTHER SPECTRA FROM THE SAMPLES No's.: 20 , 18 , 17 and 22, 23 on the following pages :

Sample Site 20 : Stone 1_spectra 1 indicates : Calcite (→ see RRUFF_CS results)

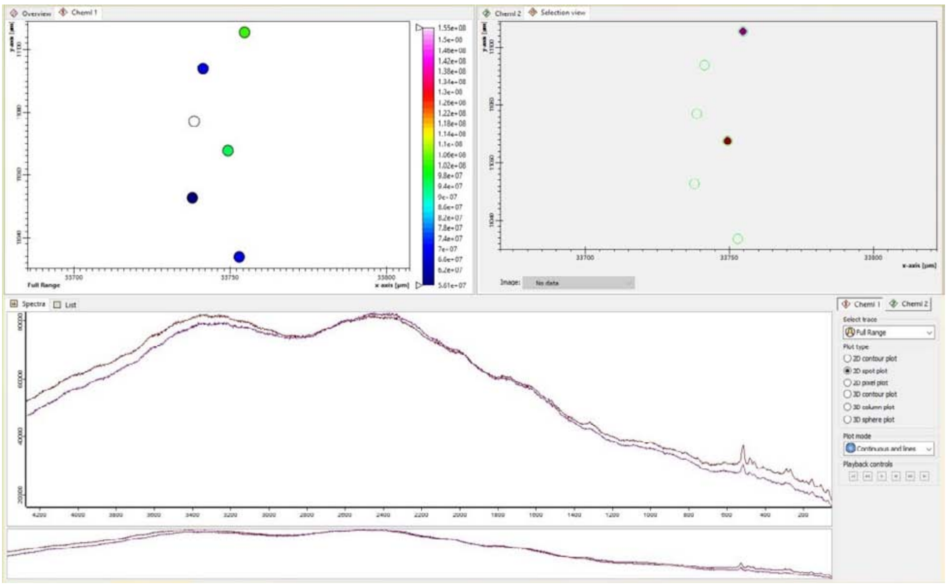


Sample :

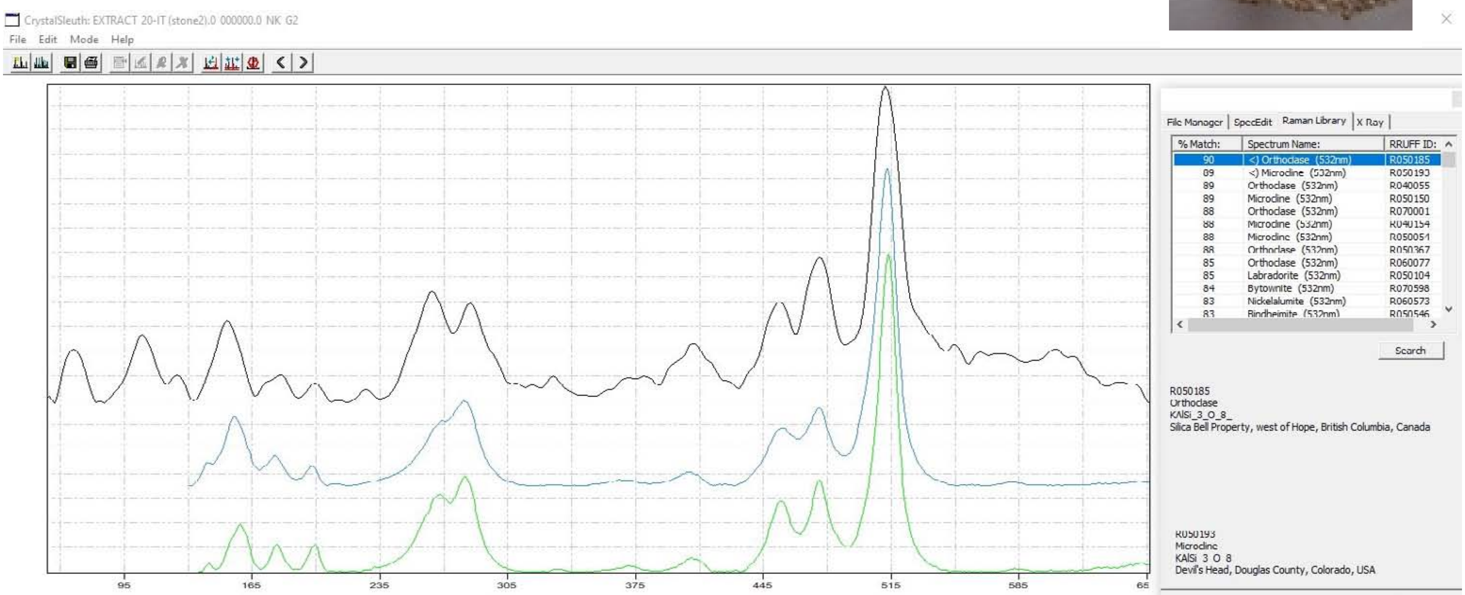


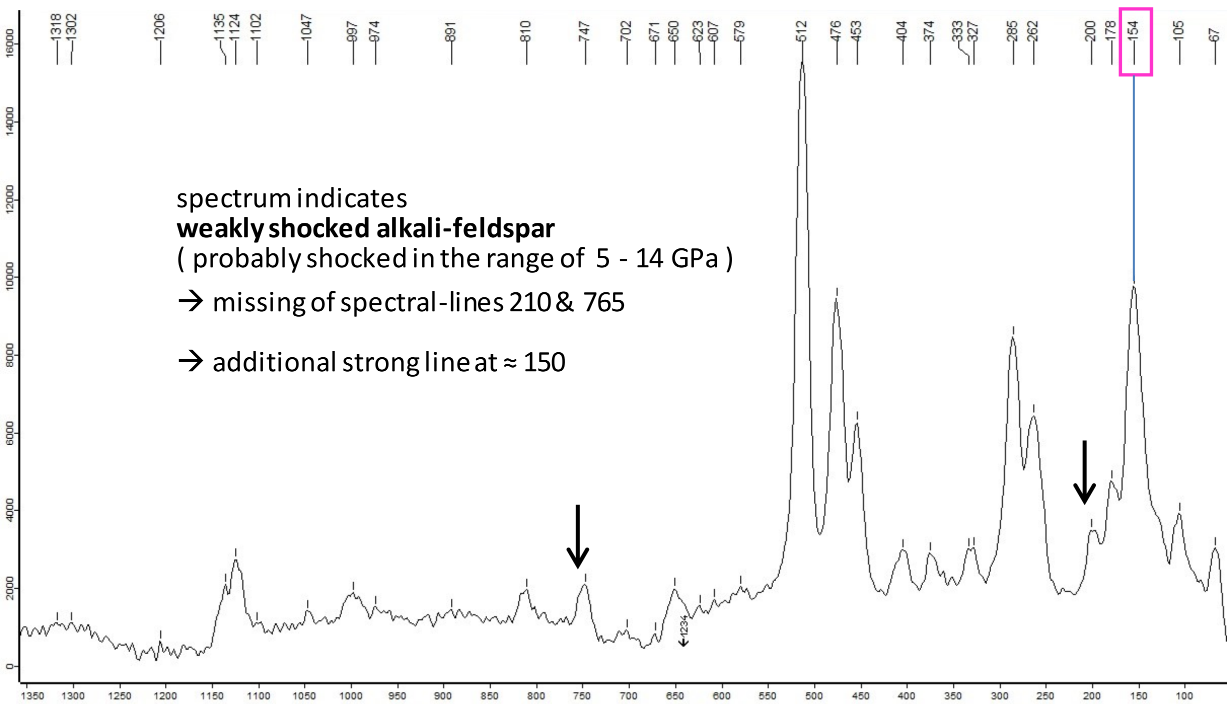


Sample Site 20 : Stone 2_spectra 1 indicates : Orthoclase , Microcline (→ see RRUFF_CS results)

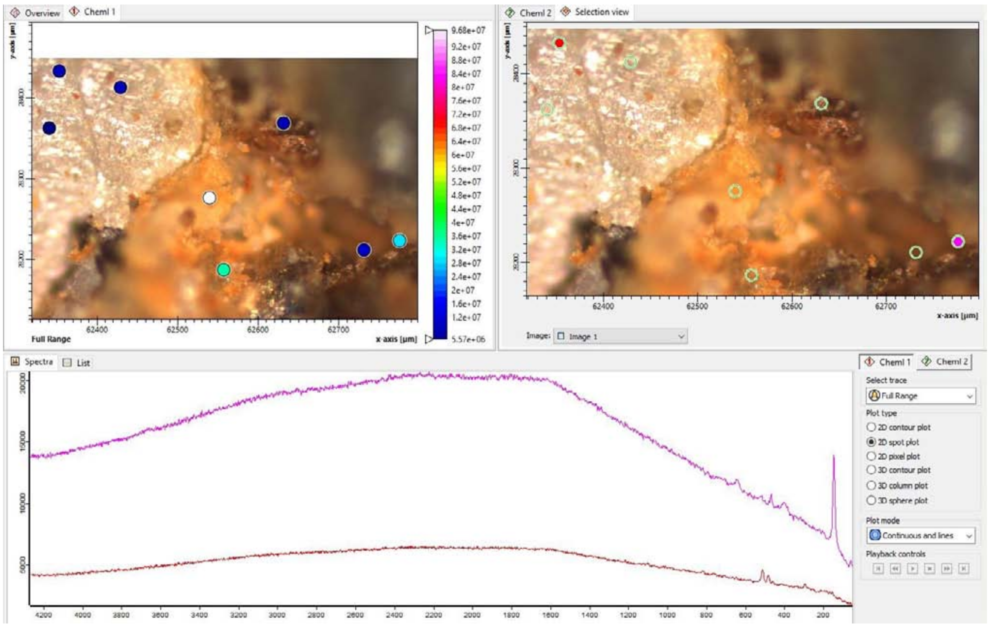


Sample :



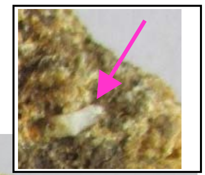


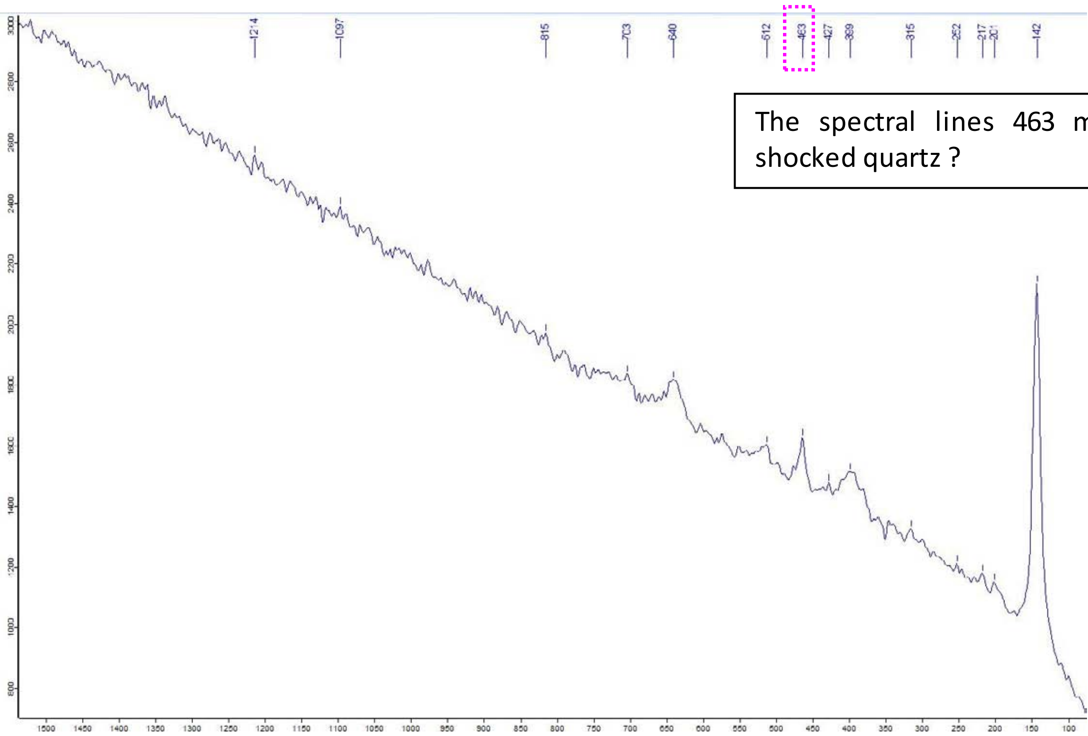
Sample Site 19 : Stone 1_spectra 1 (white crystal inclsion) indicates : Microcline , (Quartz ?)



The spectrum may also indicate shocked quartz

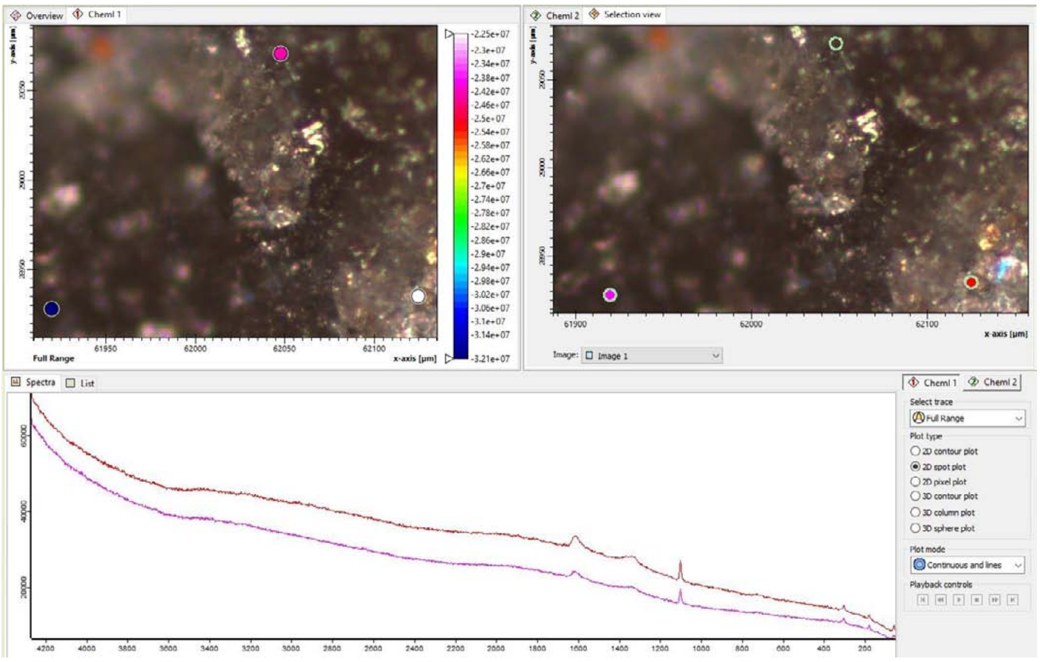
Sample :



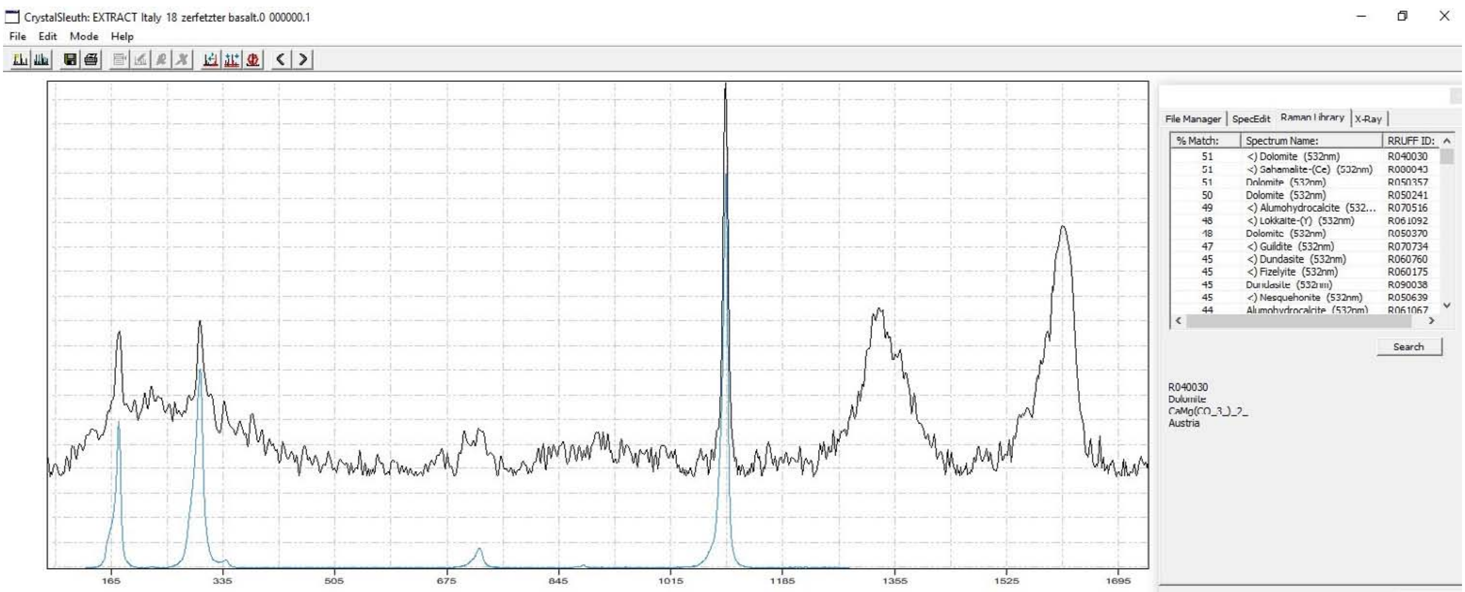


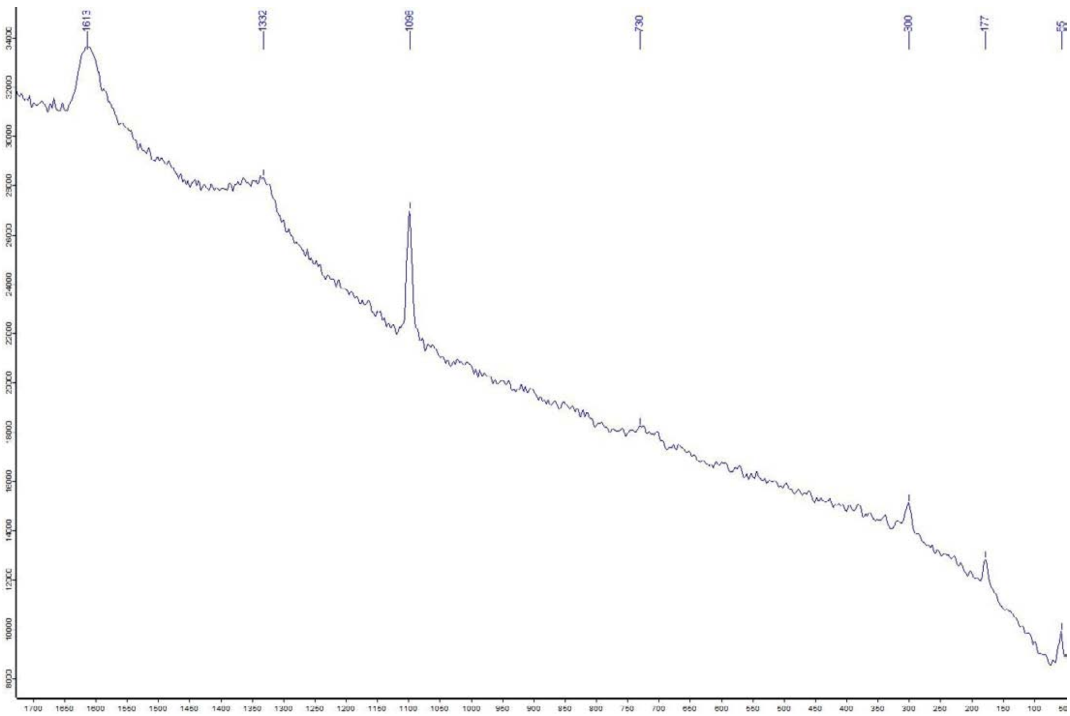
The spectral lines 463 may indicate shocked quartz ?

Sample Site 18 : Stone 2_spectra 1 (dark mineral) indicates : Dolomite , Sahamalite-(Ce) (→ RRUFF_CS)

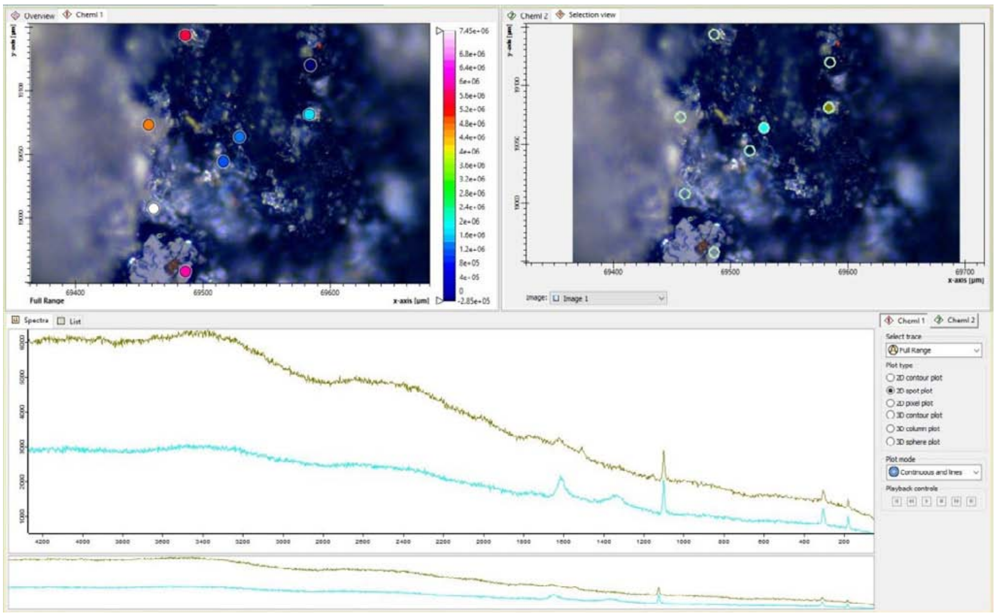


Sample :

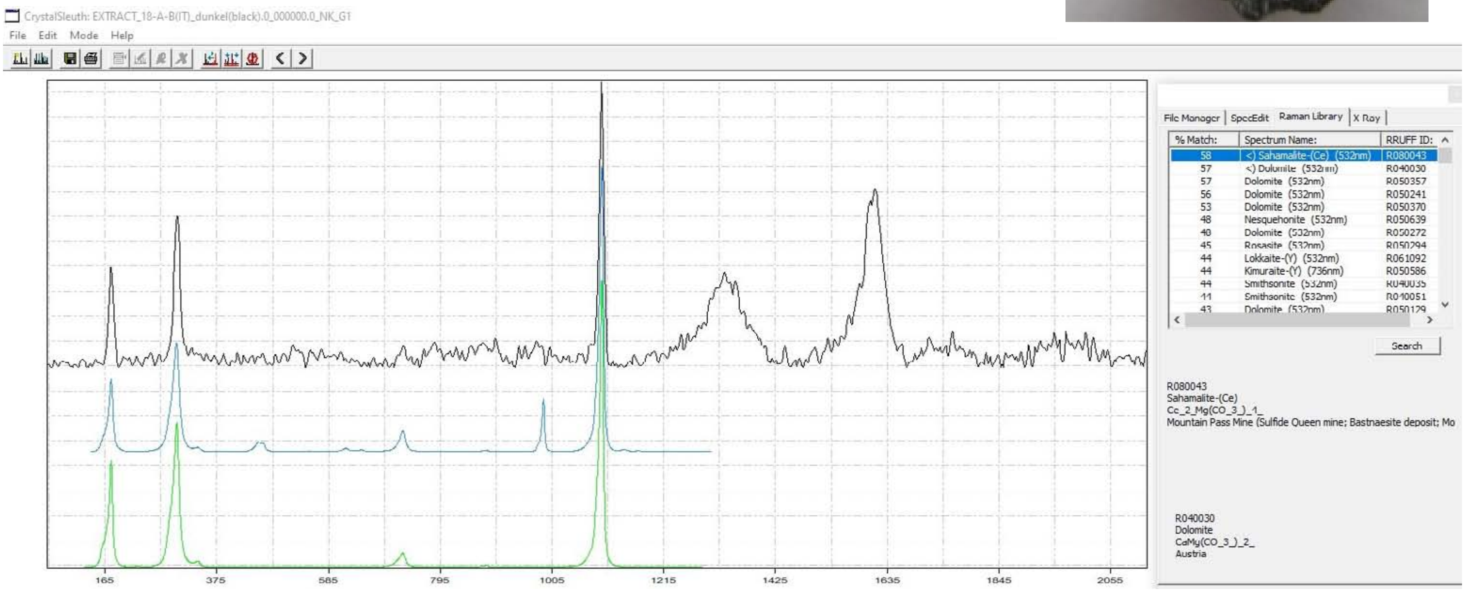


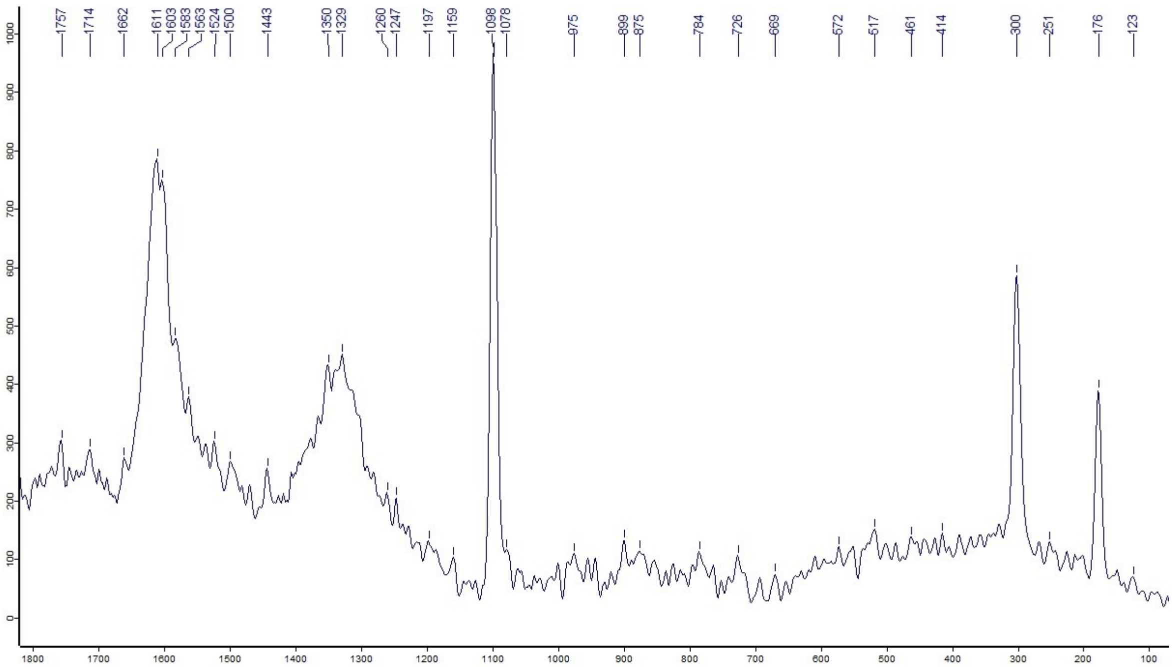


Sample Site 18 : Stone 1_spectra 1 (dark mineral) indicates : Dolomite , Sahamalite-(Ce) (→ RRUFF_CS)

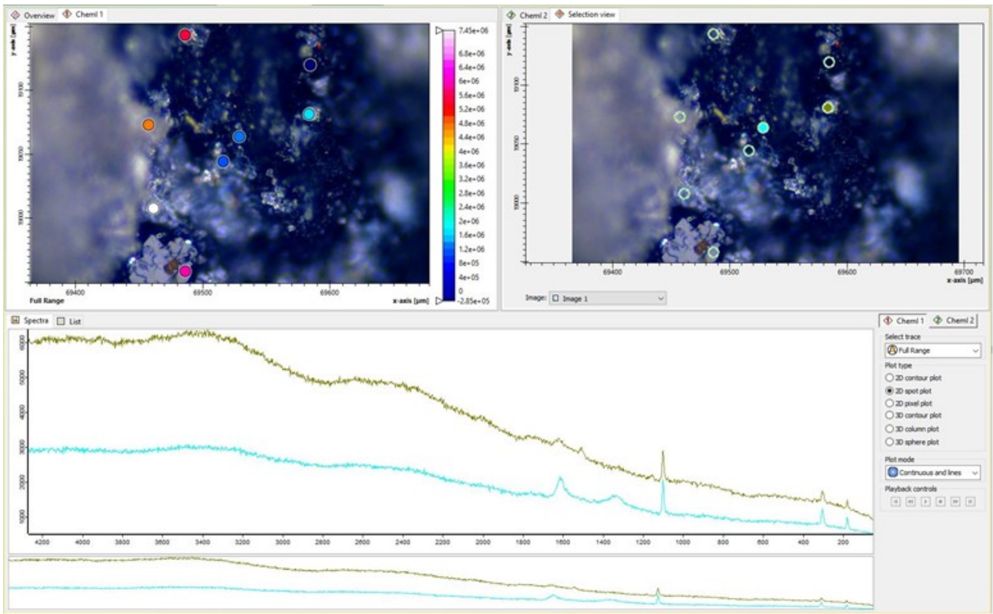


Sample :

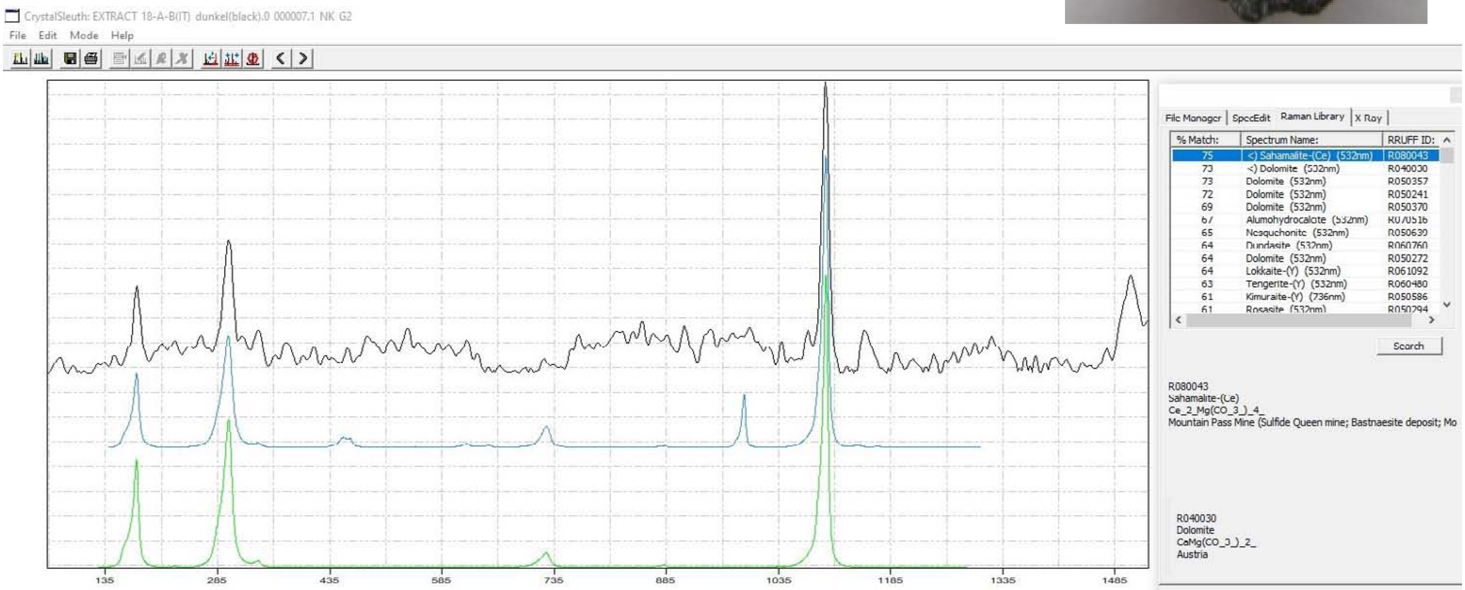


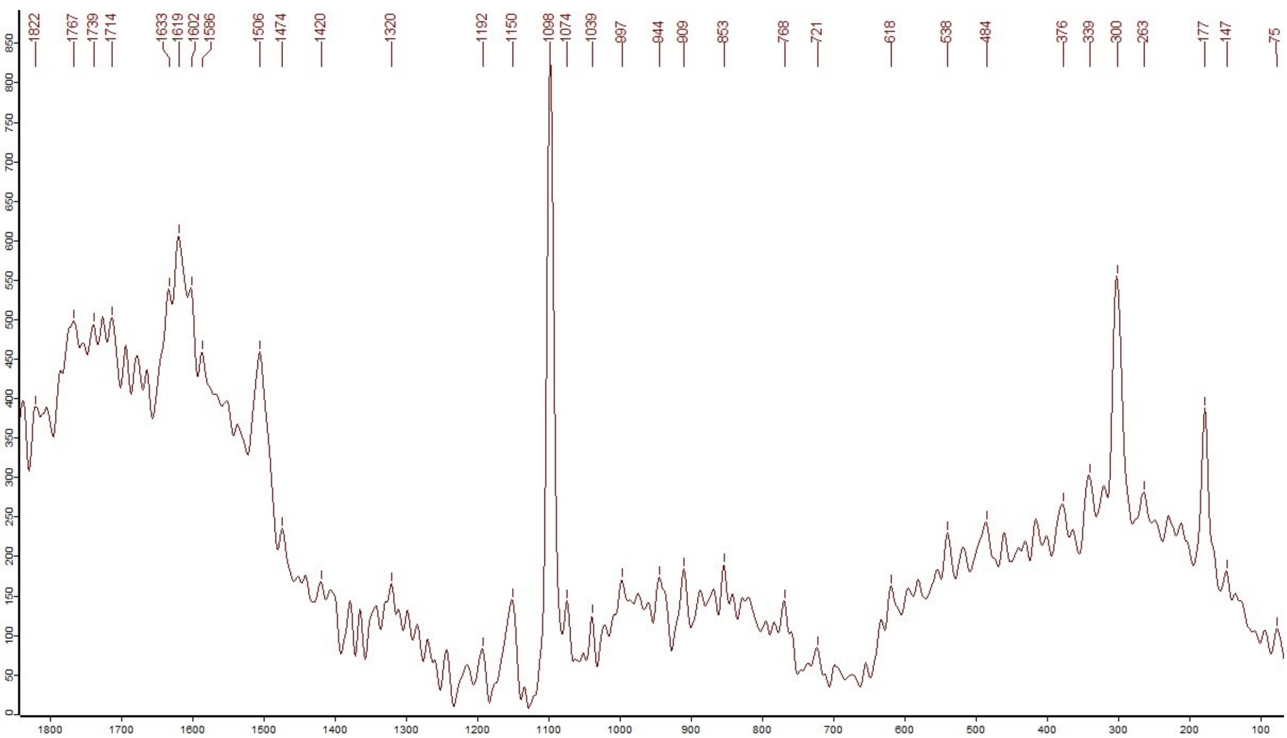


Sample Site 18 : Stone 1_spectra 2 (dark mineral) indicates : Dolomite , Sahamalite-(Ce) (→ RRUFF_CS)

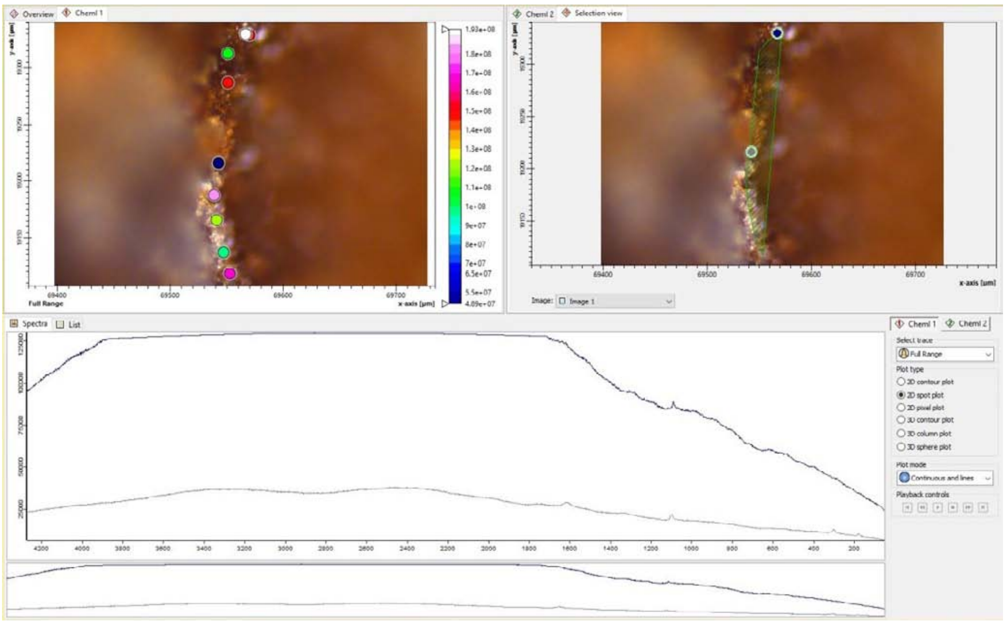


Sample :

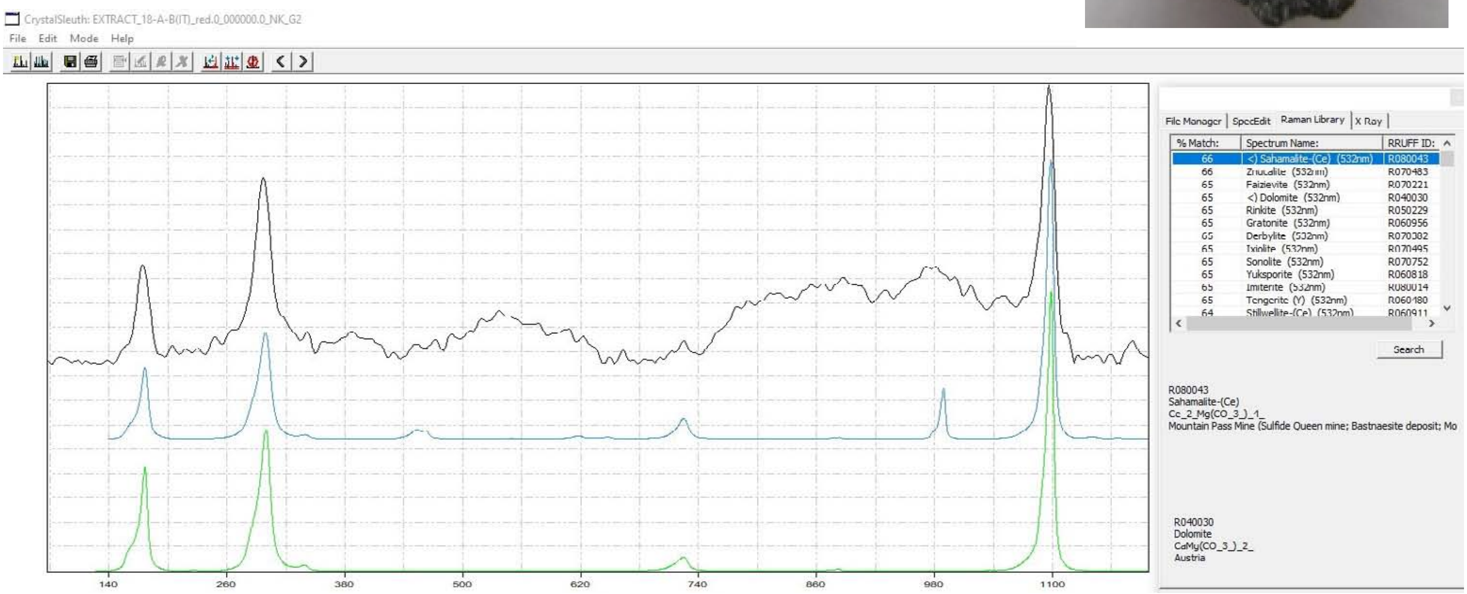


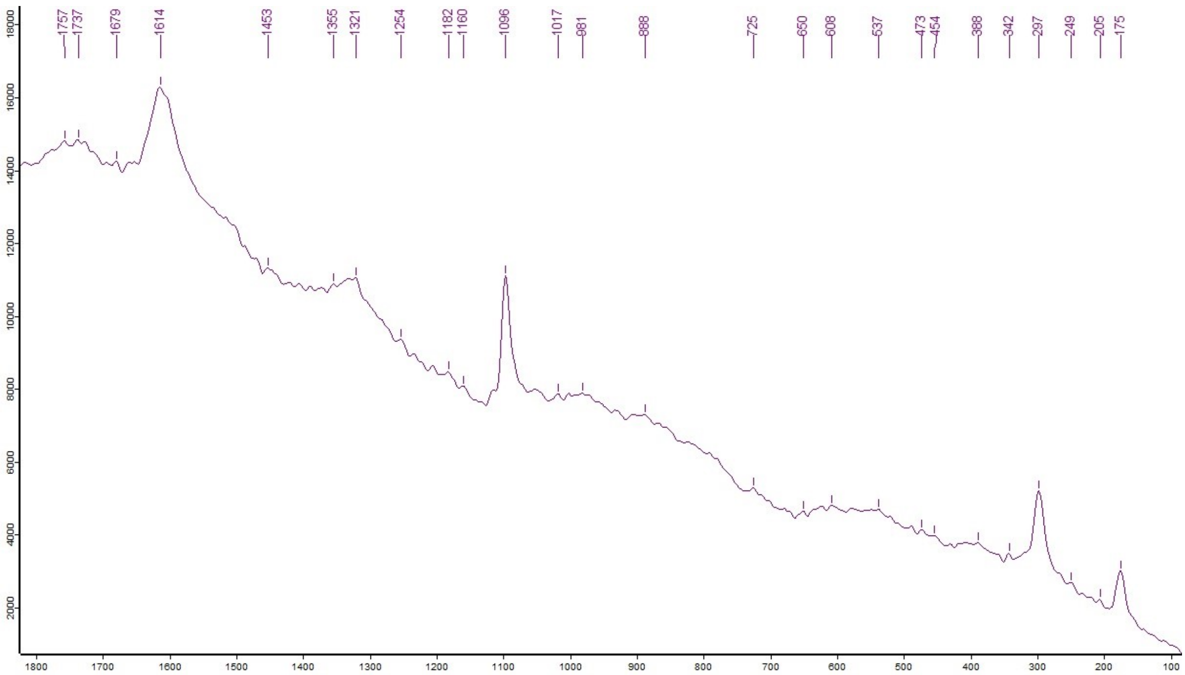


Sample Site 18 : Stone 1_spectra 3 (red mineral) indicates : Dolomite , Sahamalite (→ see RRUFF_CS)

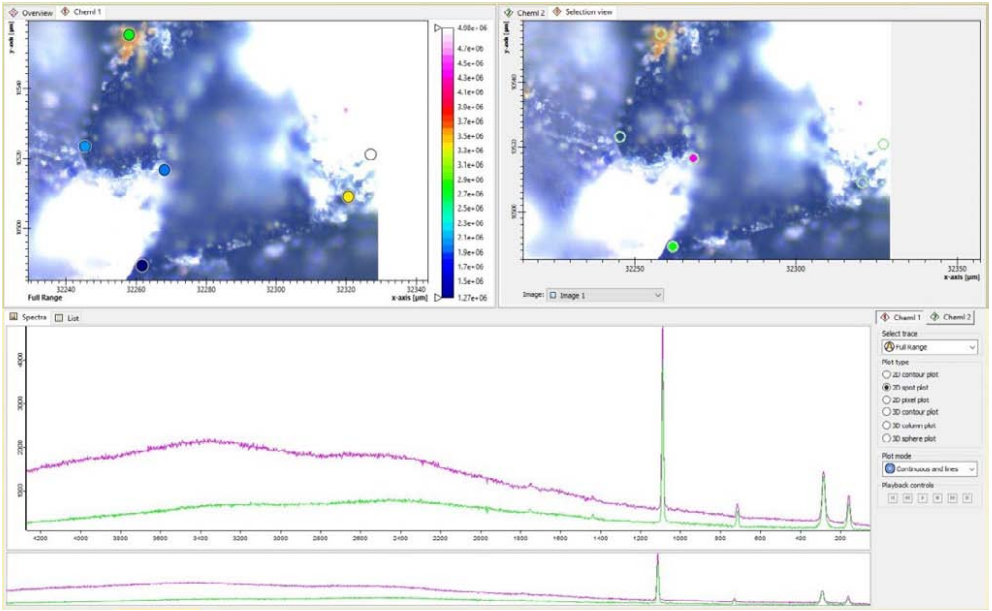


Sample :





Sample Site 17 : Stone 1_spectra 1 indicates : Calcite (→ see RRUFF_CS)



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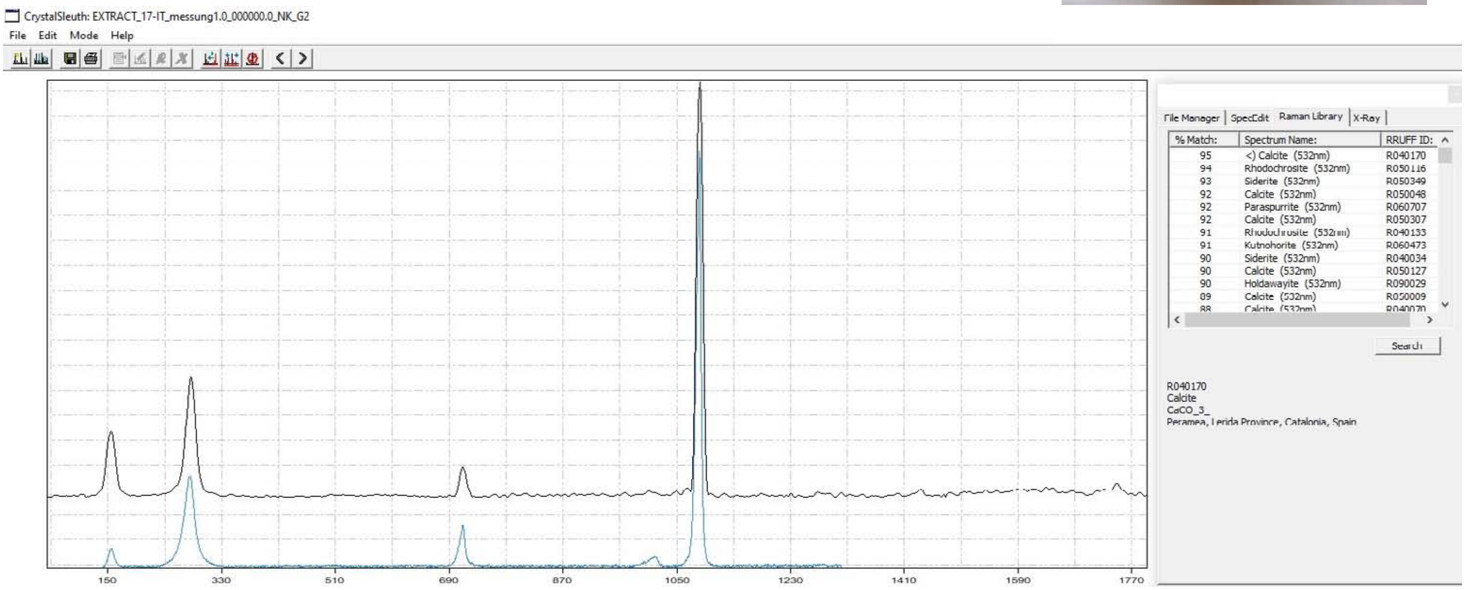
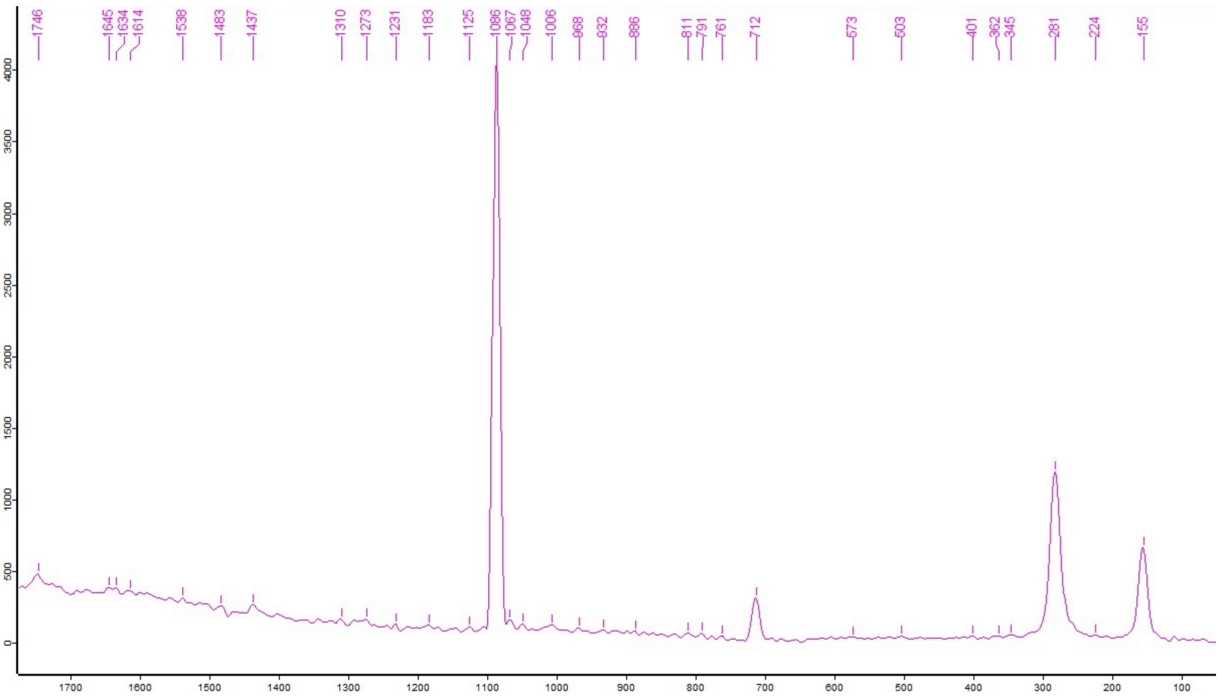
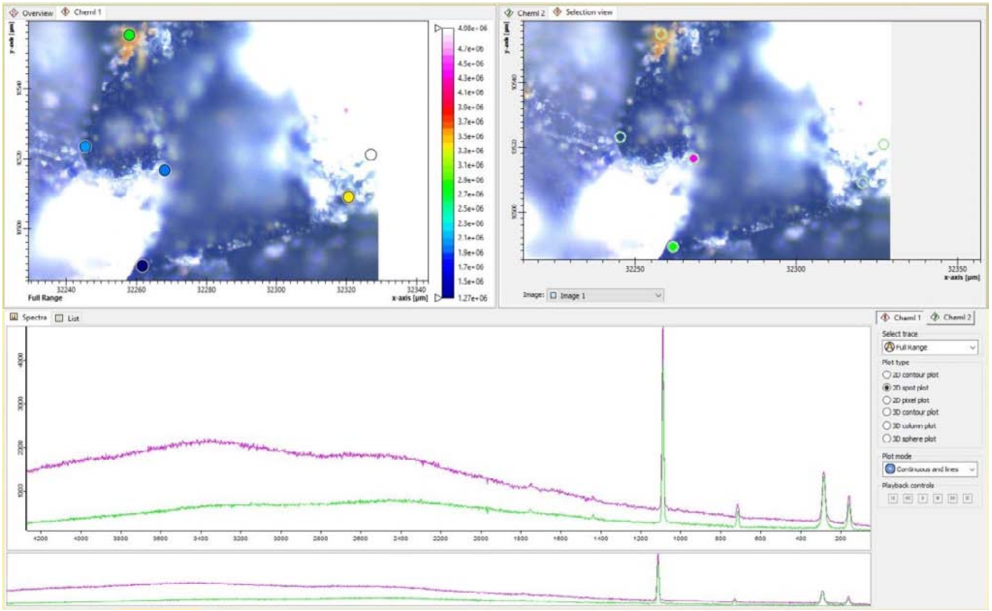
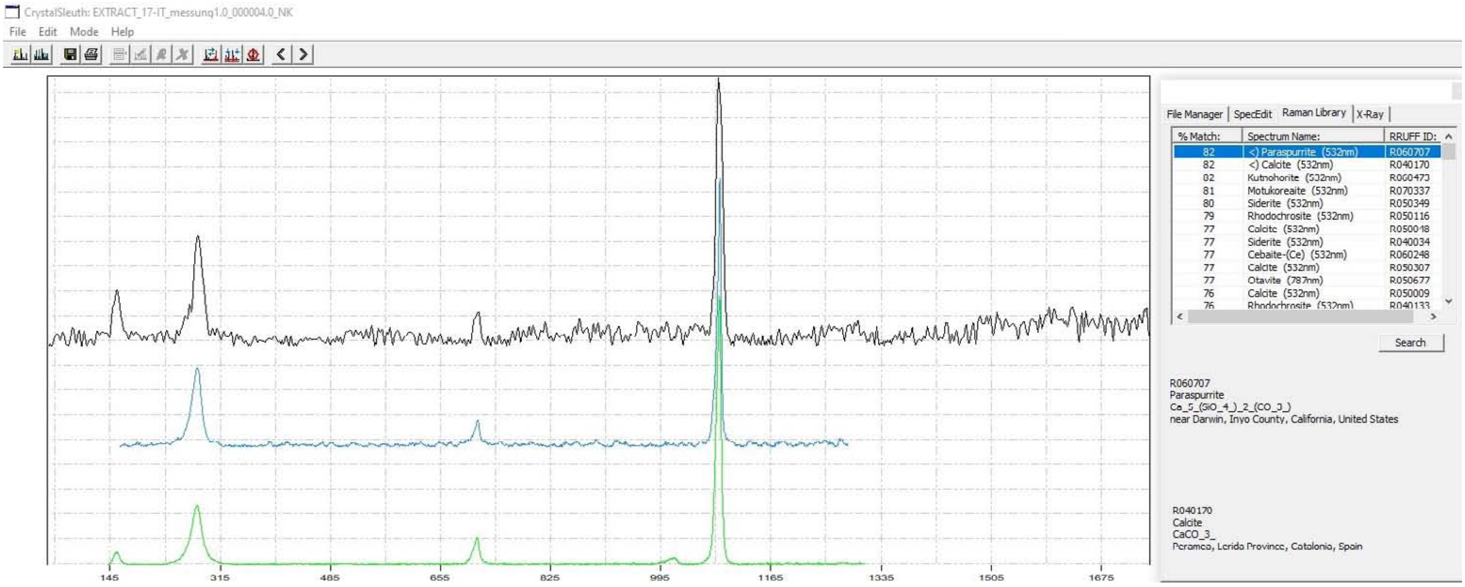




Sample Site 17 : Stone 1_spectra 2 indicates : Calcite , Paraspurrite (→ see RRUFF_CS)

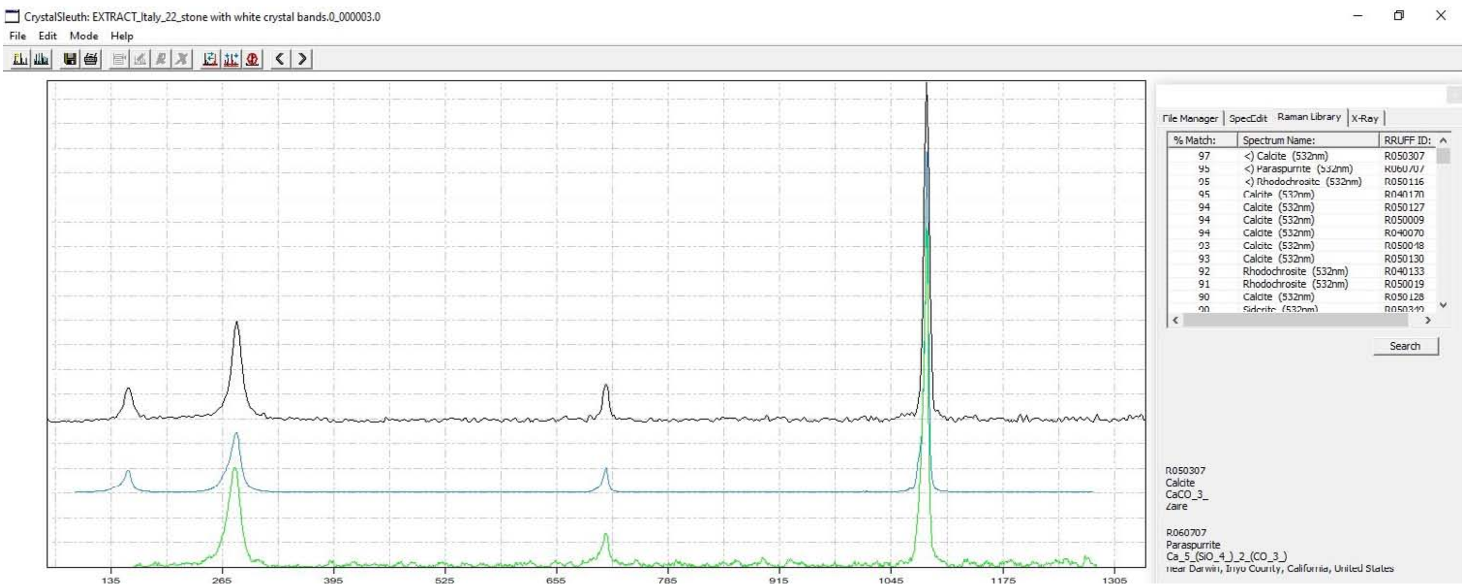


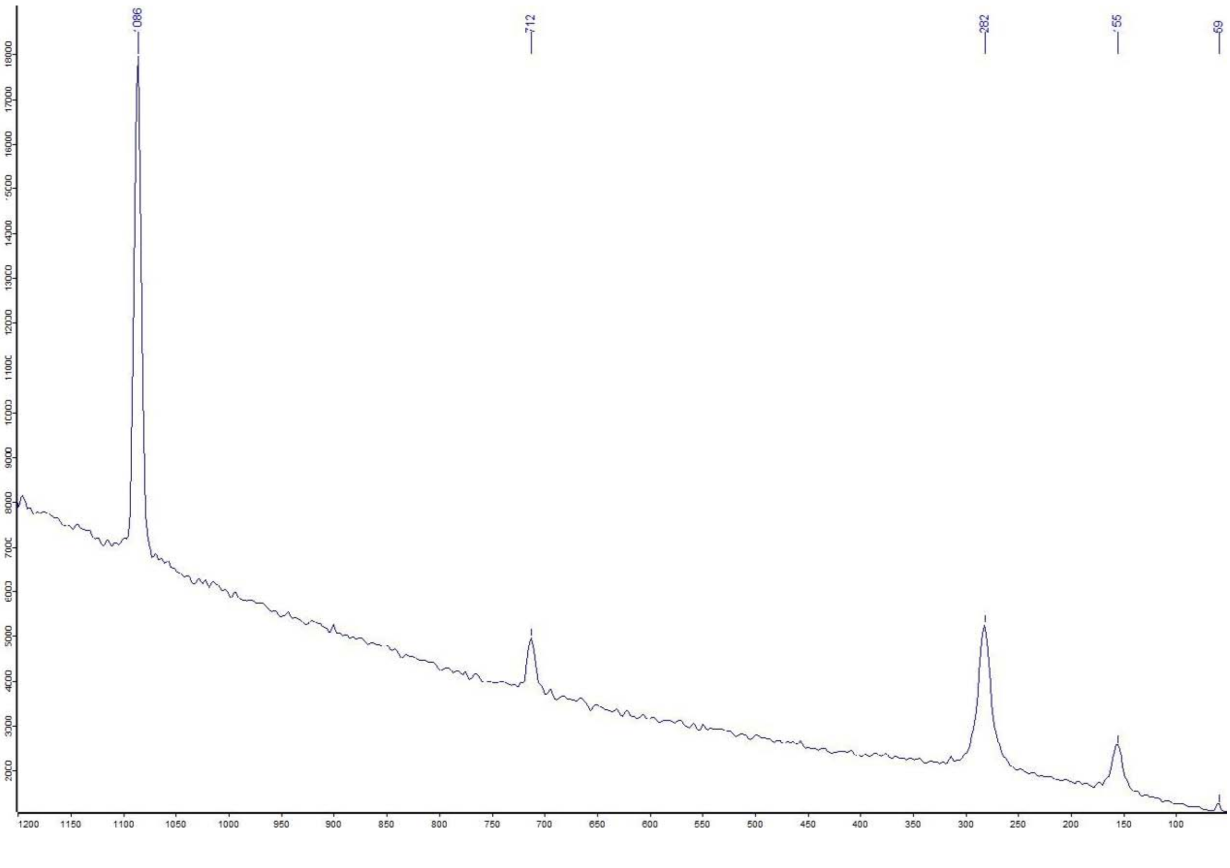
Sample :



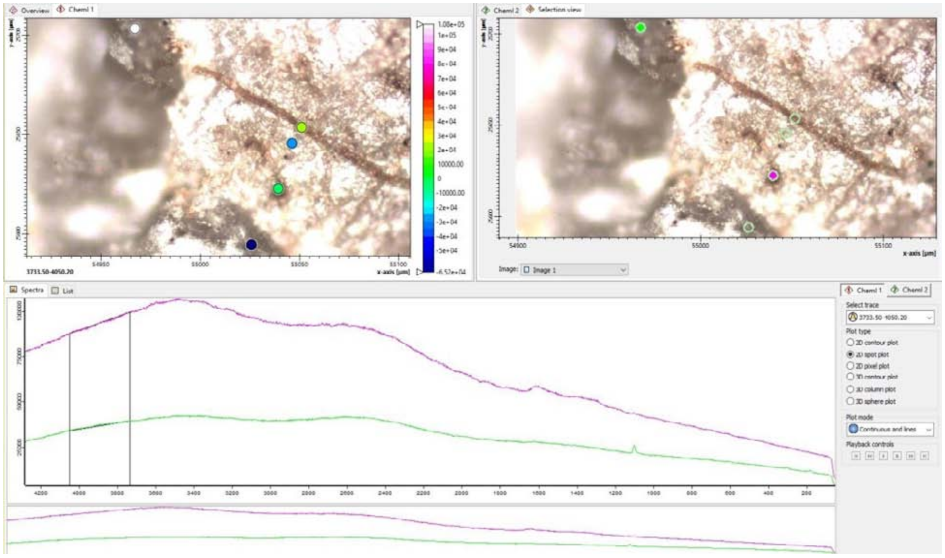
Sample Site 22 : Stone 1_spectra 1 indicates : Calcite, Paraspurrite (→ see RRUFF_CS)

Sample :

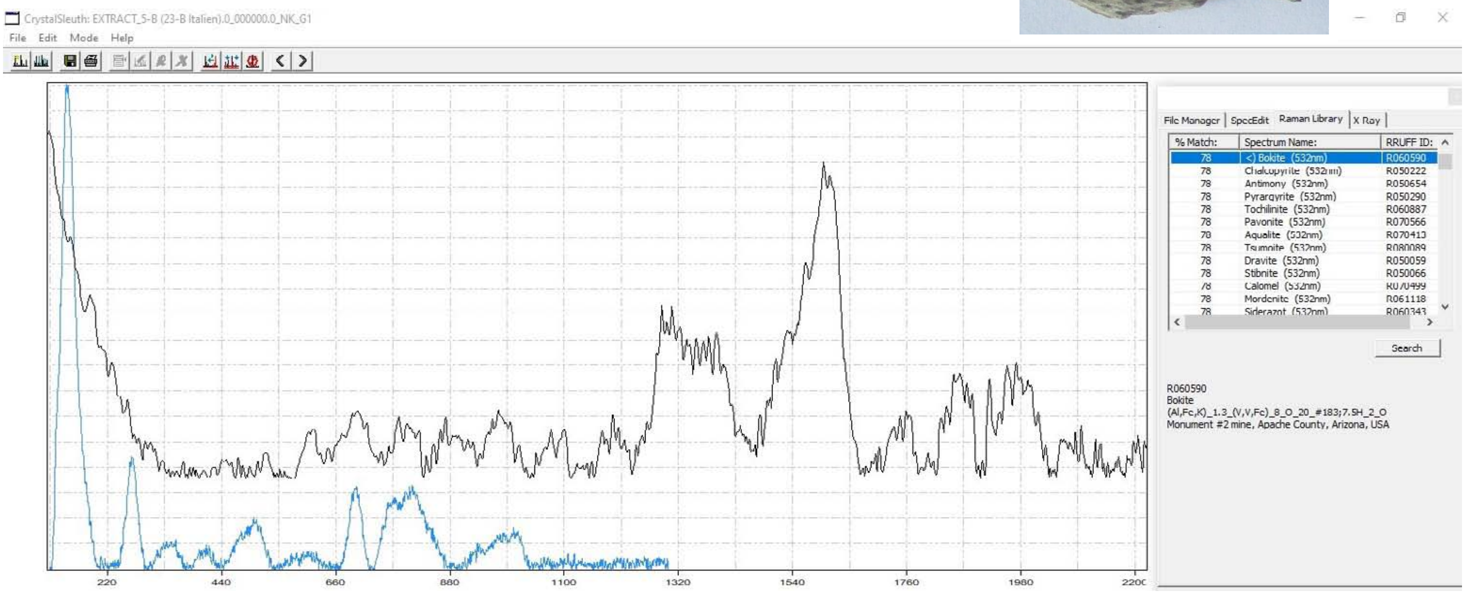


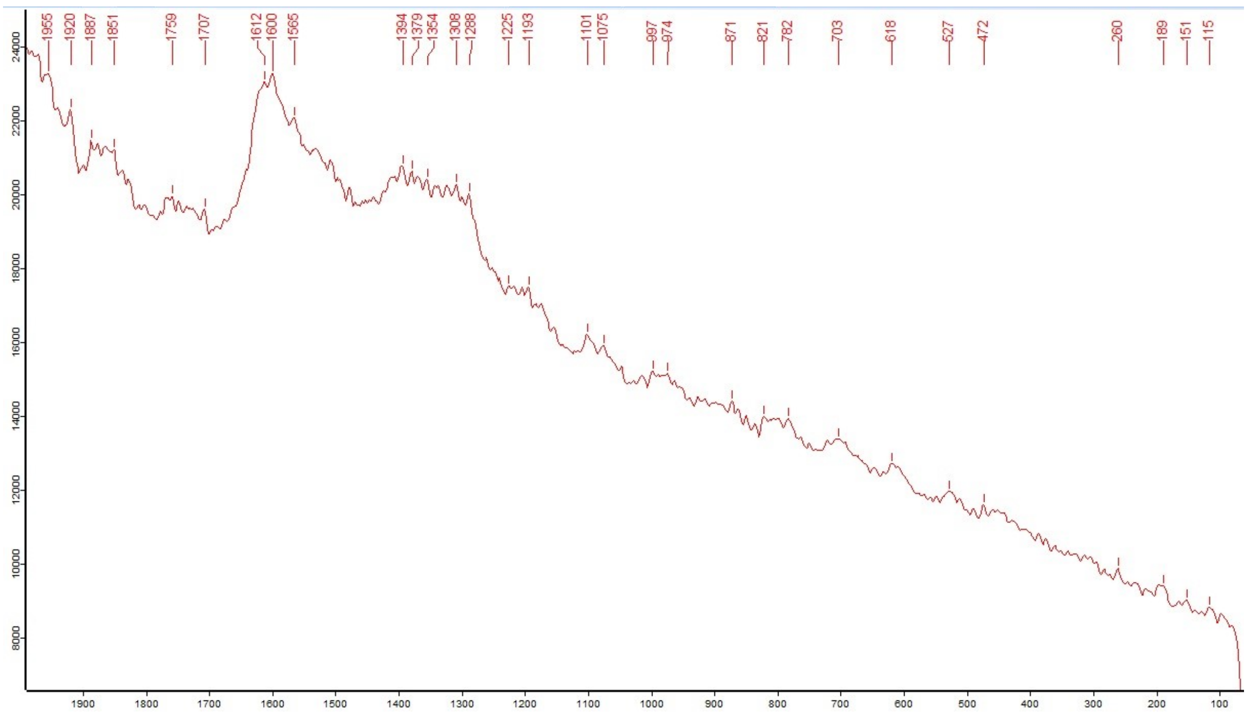


Sample Site 23-B : Stone 1_spectra 1 indicates : Bokite etc. (→ see RRUFF_CS results)



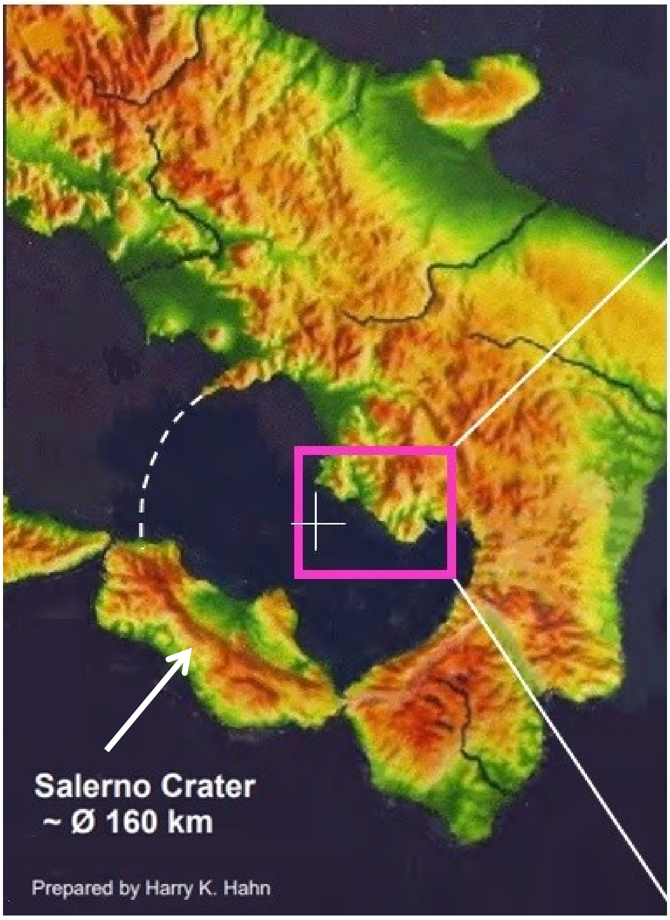
Sample :



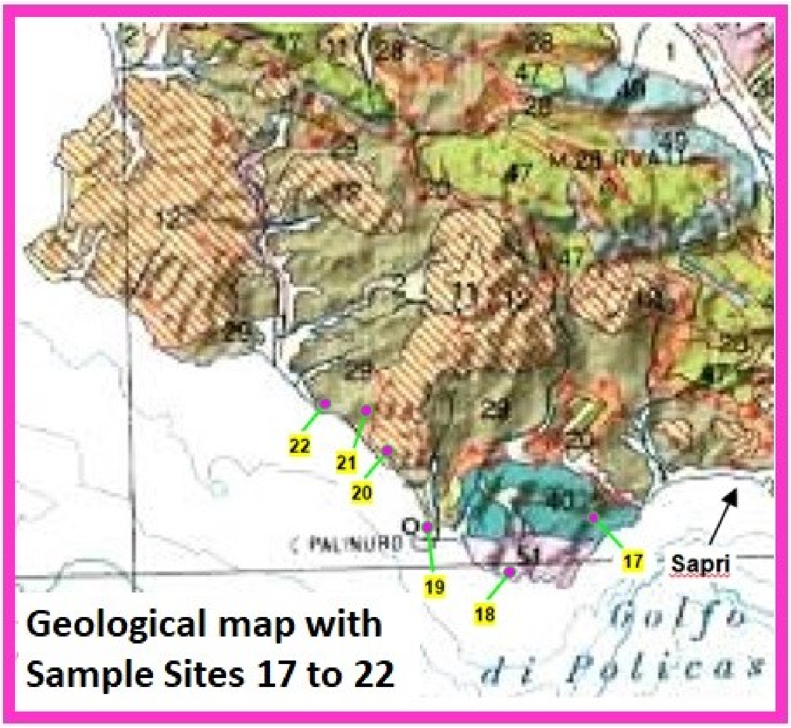


Appendix 1 : Photos of rock samples from sample sites 21-B and 18 to 23 → see next page !

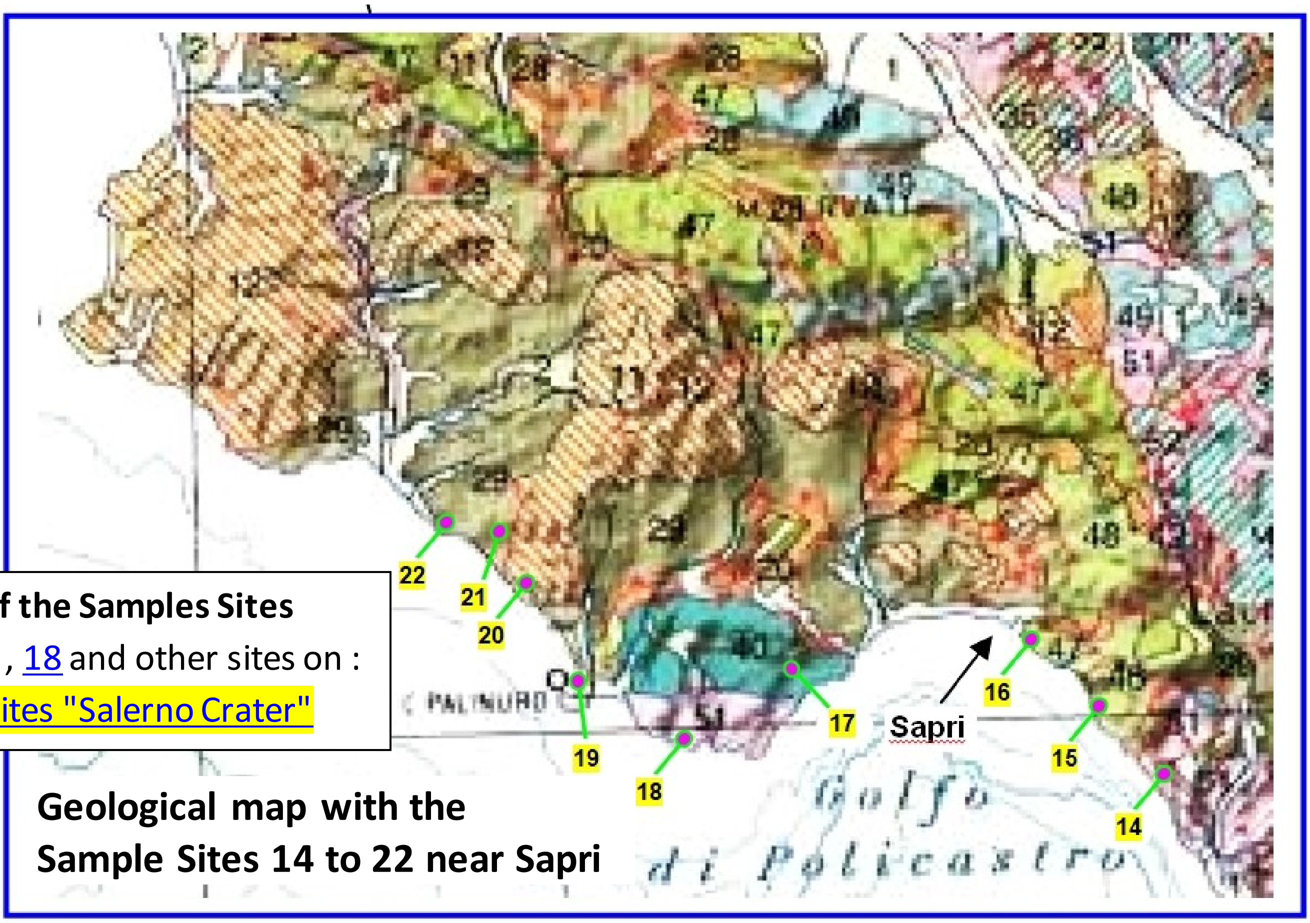
Note : Photos of all Samples Sites 18,19, 20, 21-B, 22 & 23-B and other sample sites are available on my website. → see weblink : Sample Sites "Salerno Crater"



The manipulated topographic map on the left shows the probable position of the crust fragments which form Italy, at the time of the P/T-Impact ≈253 Ma ago

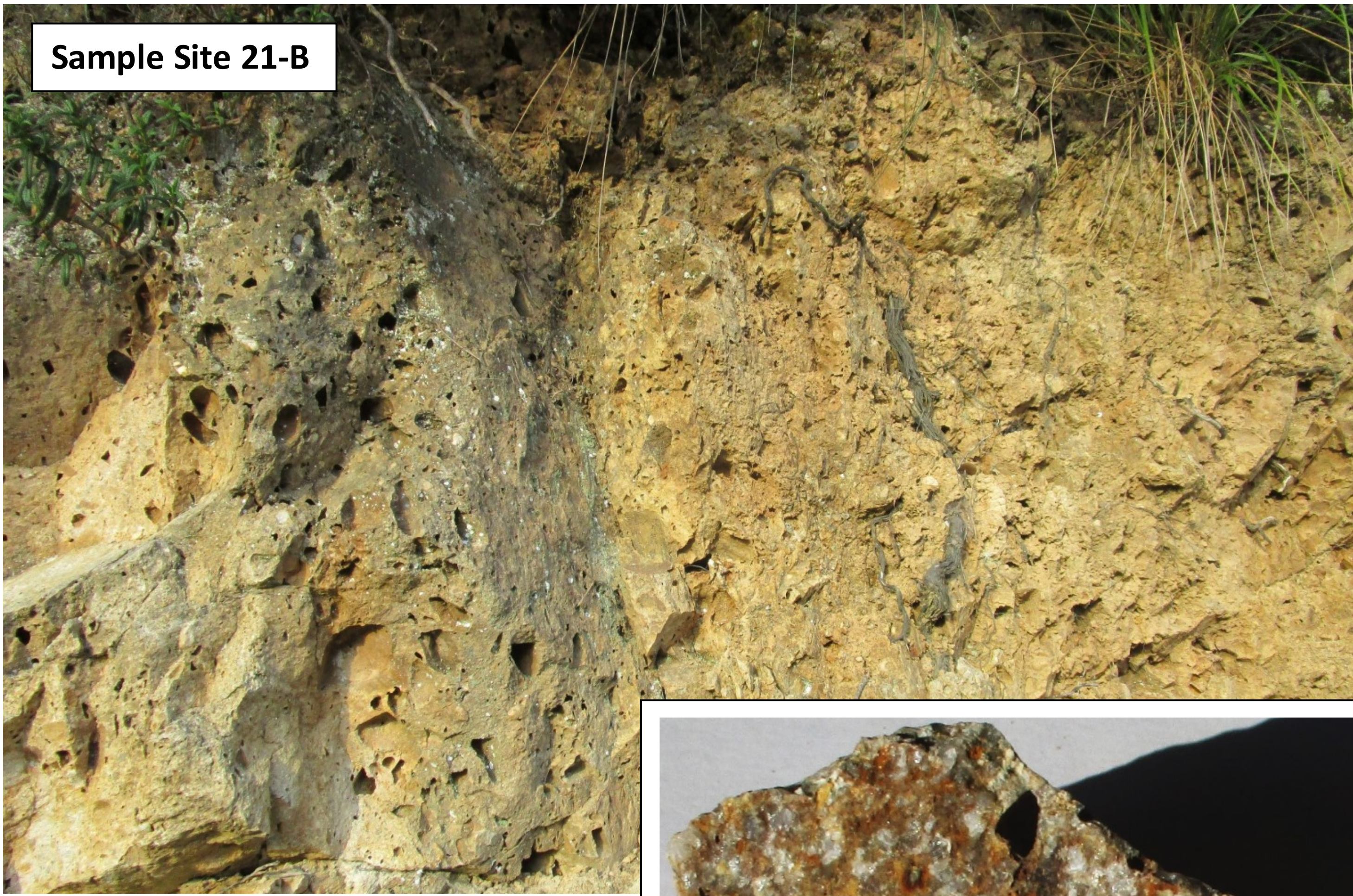


Geological map with Sample Sites 17 to 22

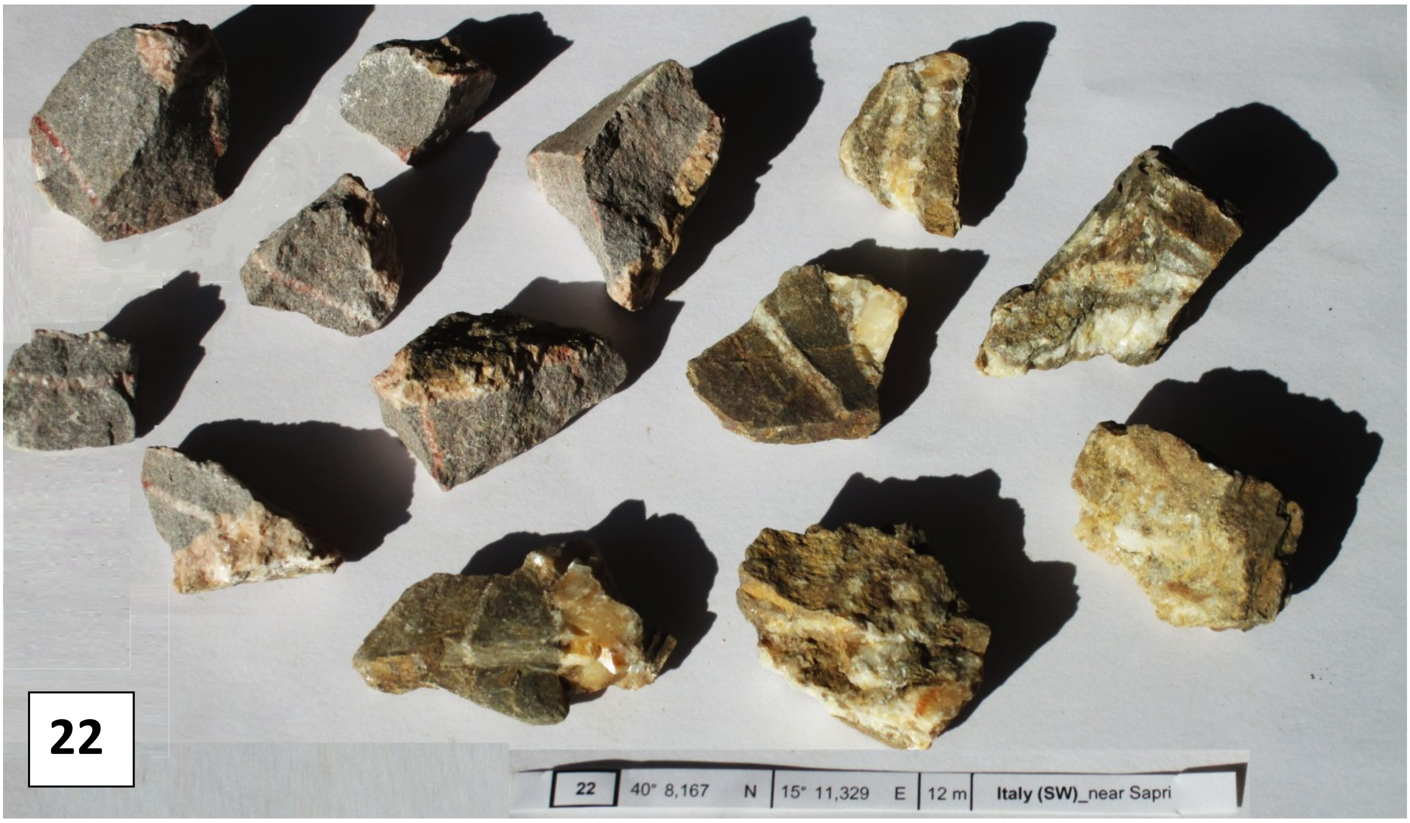


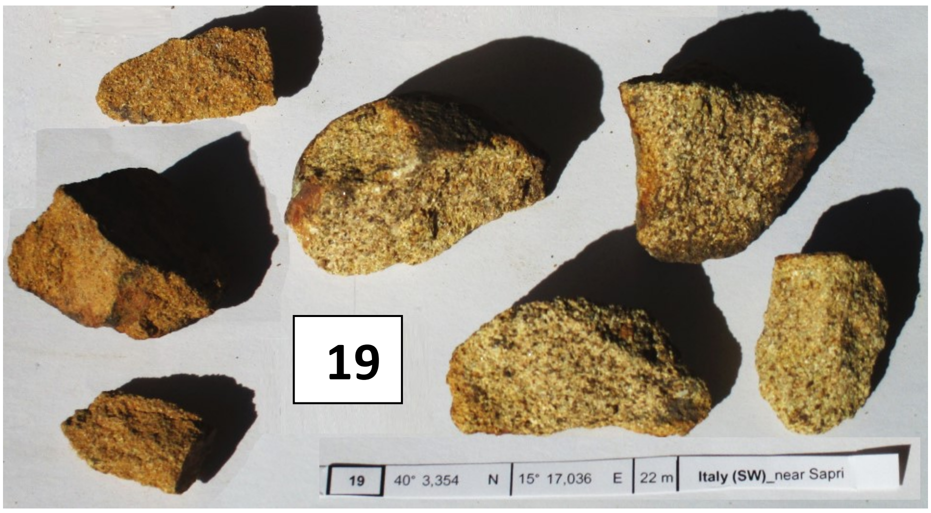
Geological map with the Sample Sites 14 to 22 near Sapri

Photos of the Samples Sites 21-B , 20 , 18 and other sites on : Sample Sites "Salerno Crater"



Note : All sample sites are relatively easy accessible over normal country roads.





Note : **All sample sites are relatively easy accessible over normal country roads.**

18-A

Sample site 18

23-B

Appendix 2 : A short overview : The Raman bands (peaks) of Quartz shocked with 22-26 GPa

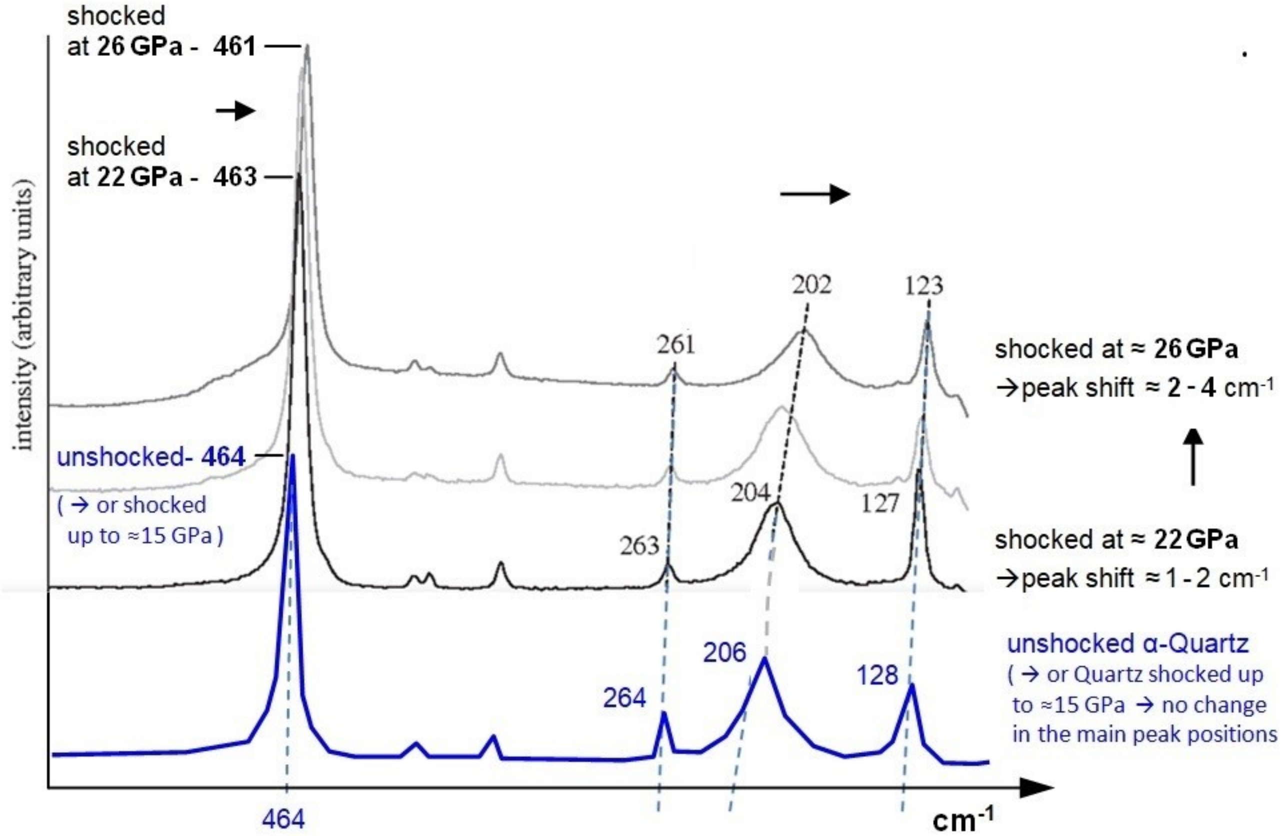
In order to verify a sample site as an impact site or impact structure, shock-metamorphic effects must be discovered in the rocks of the sample site. This can be done by different methods.

For example with the help of PDFs (planar deformation features) which are visible in the quartz with the help of a microscope. However this requires careful preparation of the samples and expertise.

Another, easier method, is the use of a RAMAN microscope. Micro-RAMAN Spectroscopy on quartz grains in the samples can provide the first evidence for a shock event, that was caused by an impact.

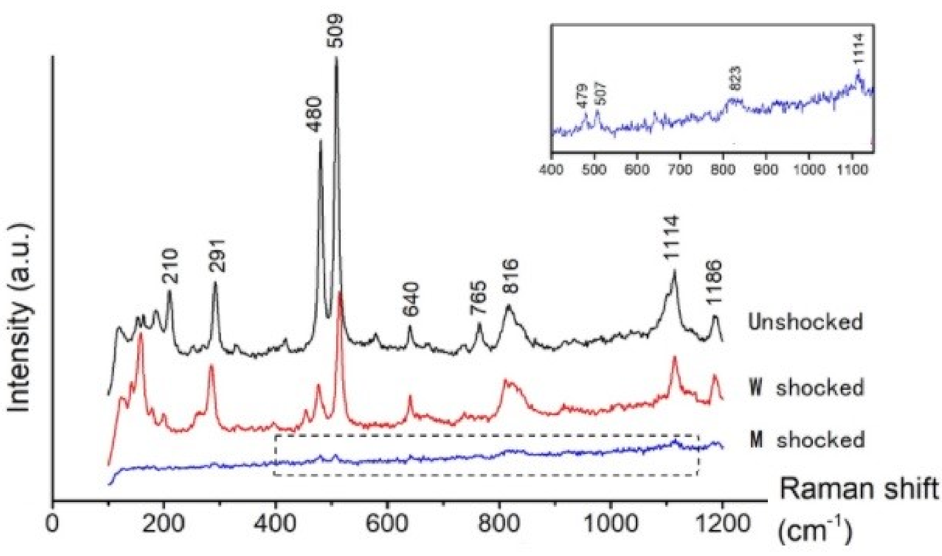
Mc Millan et al. (1992) and others have shown that the main RAMAN-peaks of Quartz shift towards lower frequencies if the Quartz was exposed the a shock-pressure > 15 GPa. → see diagram below

The shift of the main quartz RAMAN-peaks can be used to identify quartz that was shocked by an impact



Quartz shocked with **22 GPa** and **26 GPA** shows shifts of the main RAMAN-peaks of 1 - 4 cm^{-1} to lower frequencies

Appendix 3 : Raman spectra of (W) weakly-shocked & (M) moderately-shocked Alkali-Feldspar



Weakly shocked alkali feldspar mainly developed irregular fractures and undulatory extinction. Note that the Raman-lines 210 and 765 are missing in the w-shocked feldspar, and an additional line at ≈ 150 appears.

The shock pressure for the w-shocked feldspar was estimated to be between 5 and 14 GPa

References :

Photos of all Sample Sites & Rock Samples are available on : Sample Sites "Salerno Crater" (or: Samples"Salerno Crater")

Raman spectra of quartz samples from the "Bay-of-Lyon Crater" : Evidence for the Bay-of-Lyon Impact Crater (or: Link2)

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Part 1 : The 1270 X 950 km Permian-Triassic Impact Crater caused Earth's Plate Tectonics of the Last 250 Ma

Part 2 : The Permian-Triassic Impact Event caused Secondary-Craters and Impact Structures in Europe, Africa & Australia

Part 3 : The PT-Impact Event caused Secondary-Craters and Impact Structures in India, South-America & Australia

Part 4 : The PT-Impact Event and its Importance for the World Economy and for the Exploration - and Mining-Industry

Part 5 : Global Impact Events are the cause for Plate Tectonics and the formation of Continents and Oceans (Part 5)

Part 6 : Mineralogical- and Geological Evidence for the Permian-Triassic Impact Event

Alternative weblinks for my Study **Parts 1 - 6 with slightly higher resolution** : Part 1, Part 2, Part 3, Part 4, Part 5, Part 6

Parts 1 – 6 of my PTI-hypothesis are also available on my website : **www.permiantriassic.de** or **www.permiantriassic.at**

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