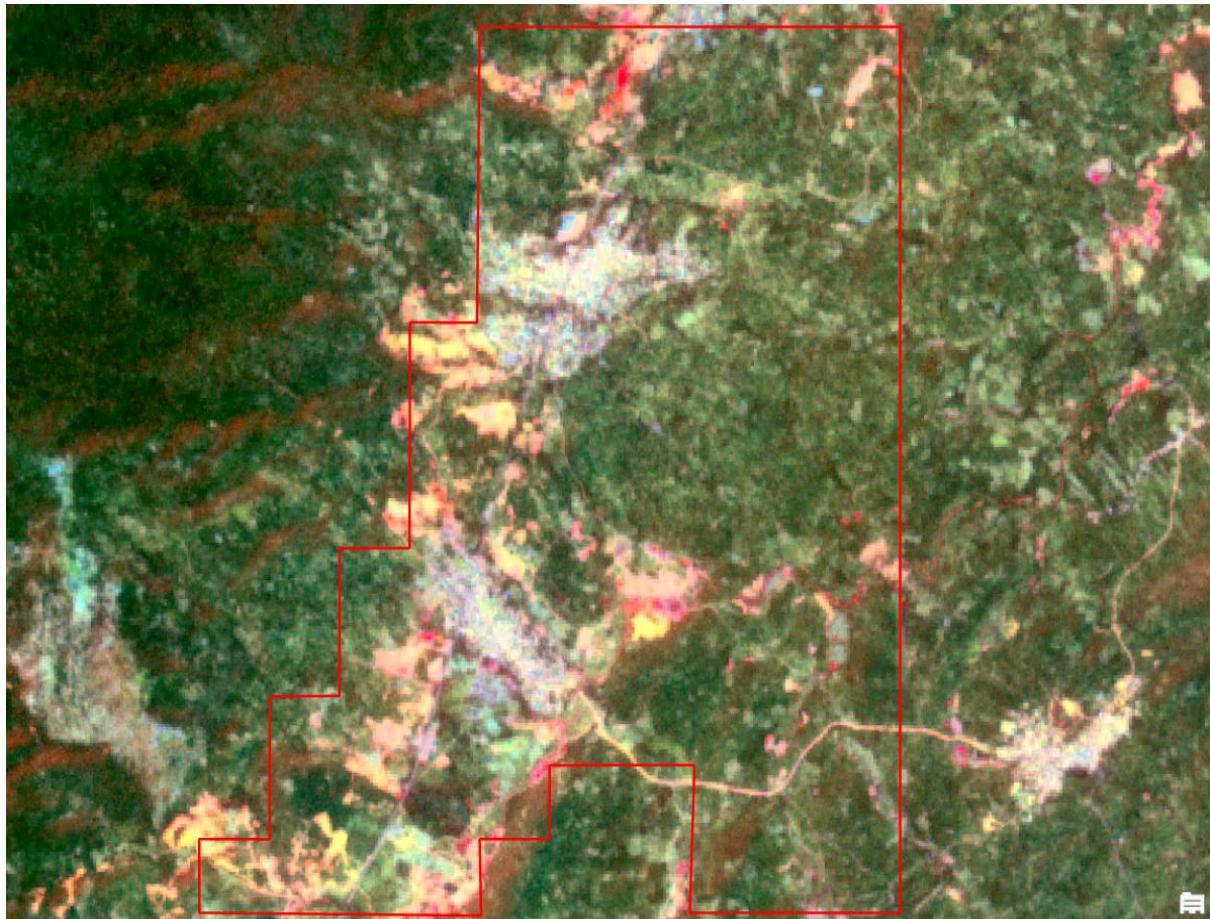


## Gold mineralization in east Ghana

This report outlines the application of remote sensing techniques using medium resolution imagery to detect gold-related mineral alterations at the red path shown, located in Ghana's Ashanti Gold Belt. The Ashanti Gold Belt is a globally significant region for orogenic gold deposits, hosted in Birimian greenstone belts characterized by hydrothermal alteration zones rich in minerals such as **kaolinite, sericite, chlorite, alunite, and iron oxides** (e.g., **hematite, goethite**). Gold itself is not spectrally distinct in remote sensing data especially in medium resolution, so the focus is on mapping alteration minerals that commonly accompany gold mineralization.

This report details such methods to highlight mineral alterations and hydrothermal alterations linked to gold, and enhance subtle mineral signatures. These methods are tailored to the tropical, vegetated environment of the study area, where vegetation interference is a challenge. Recommendations for preprocessing, such as NDVI masking, and practical considerations for field validation are included to support your gold exploration efforts.

- You can download the red path using this URL



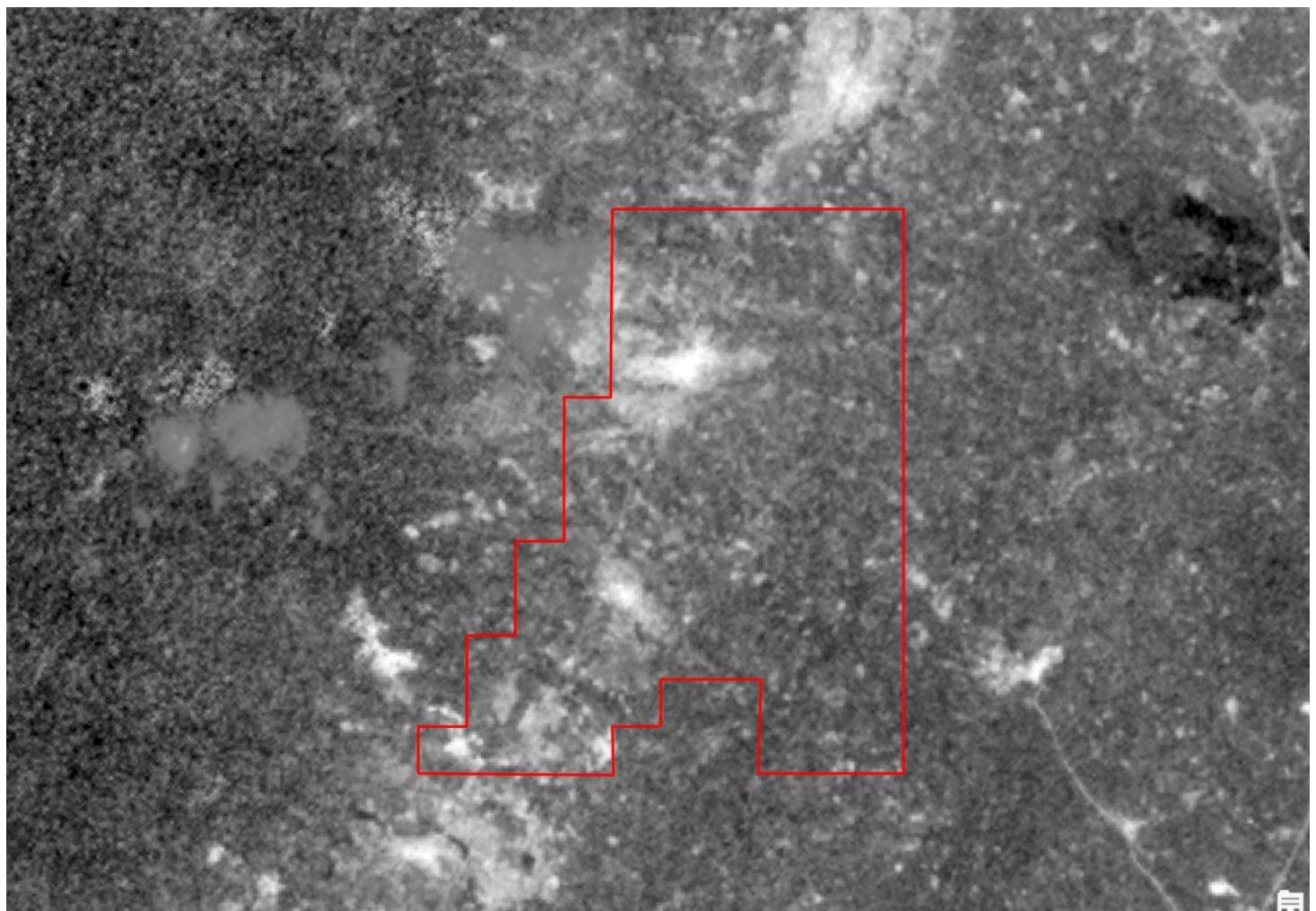
[https://drive.google.com/file/d/1xJXTxzOo8i0pAxiRCFLxKcM\\_XdgJZ45p/view?usp=drive\\_link](https://drive.google.com/file/d/1xJXTxzOo8i0pAxiRCFLxKcM_XdgJZ45p/view?usp=drive_link)

Open it using google earth or any GIS software .

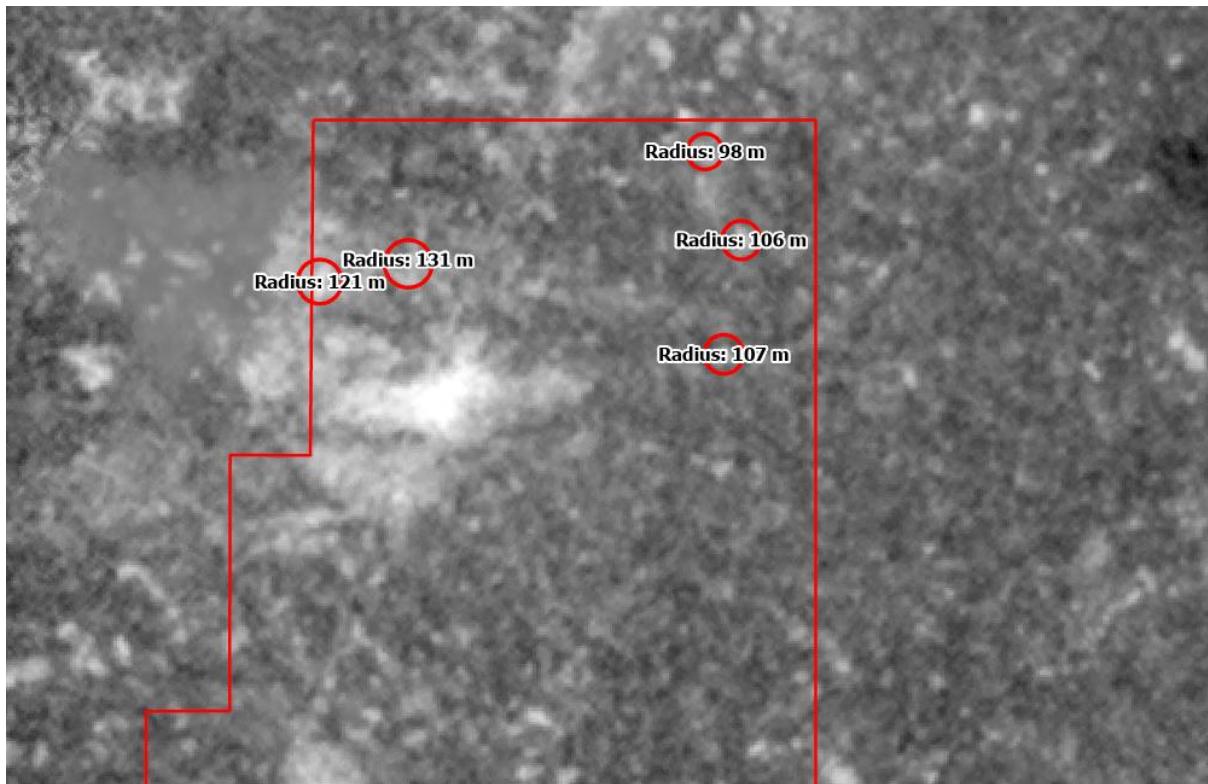
## First technique

enhance the spectral contrast between minerals by dividing the reflectance of one band by another, highlighting specific absorption features. For gold exploration, we target minerals like iron oxides (hematite, goethite), kaolinite, alunite, and sericite, which are associated with gold deposits in the Ashanti Gold Belt. These minerals indicate oxidized zones (e.g., gossans) or alteration halos around gold-bearing quartz veins

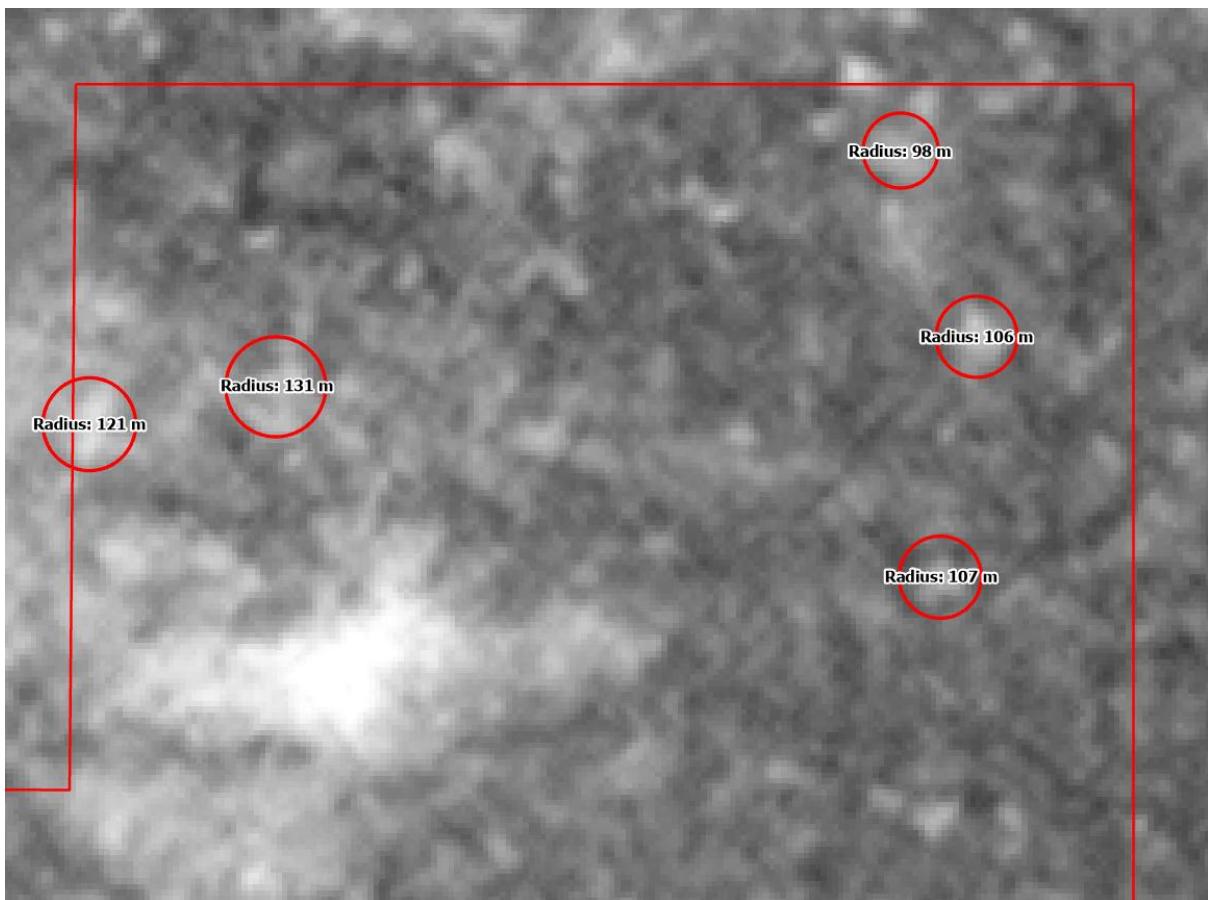
- **Detects iron oxides (hematite, goethite), common in weathered gold deposits or gossan zones this shown in figure 1 as bright pixels .**



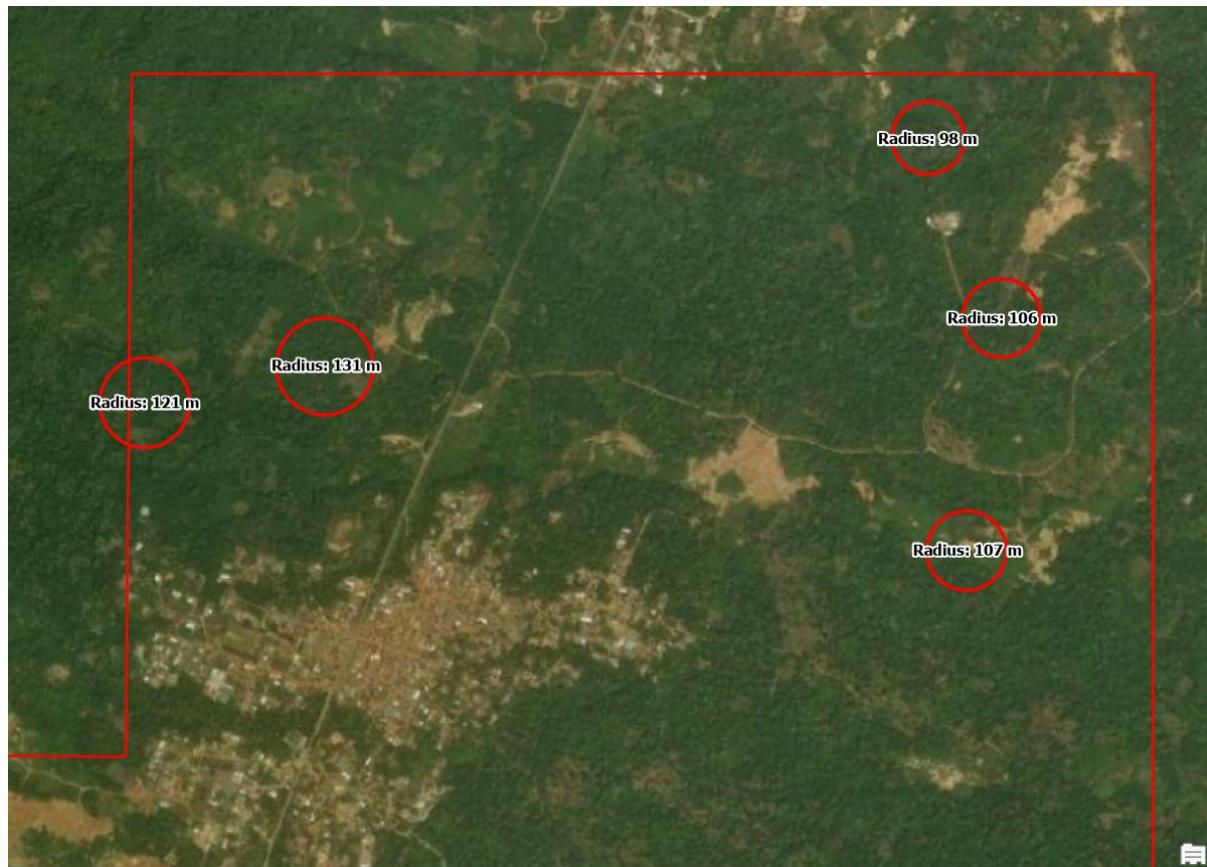
**Figure 1**



**Figure 2A**



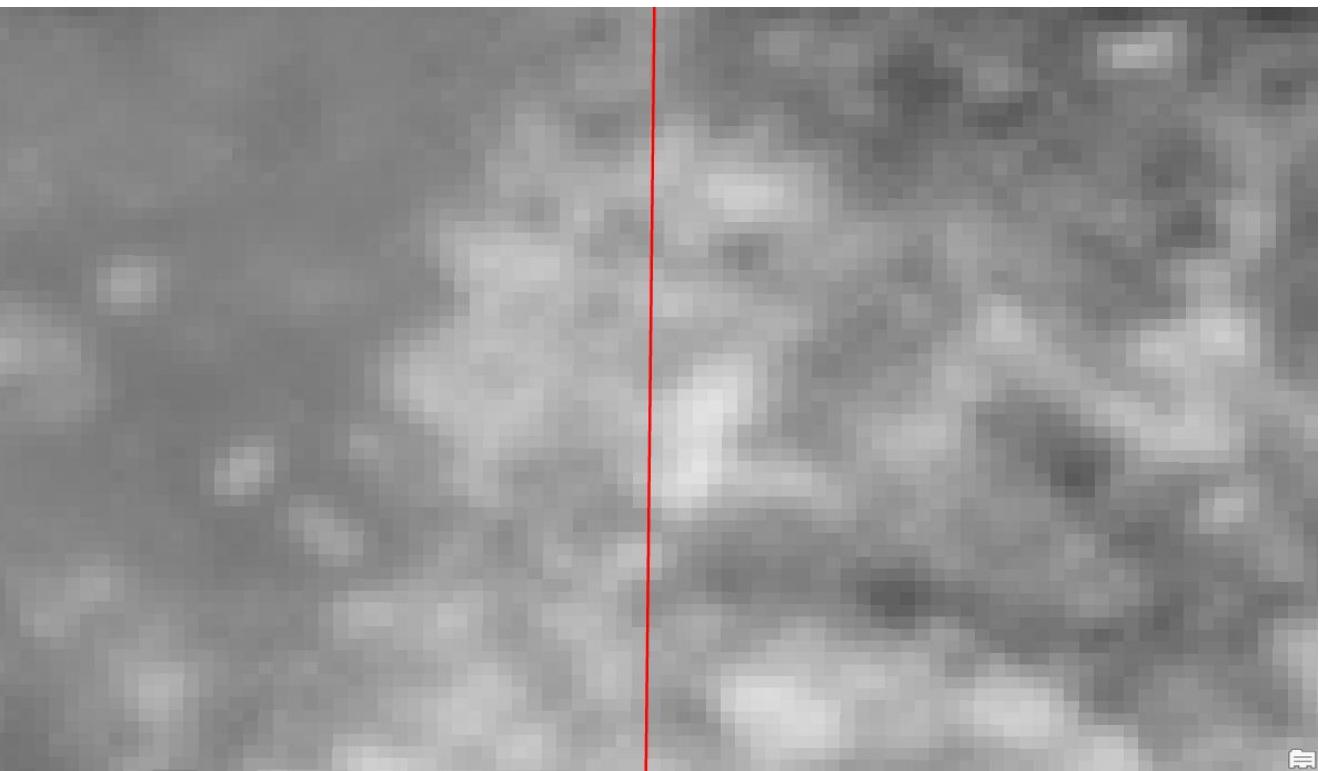
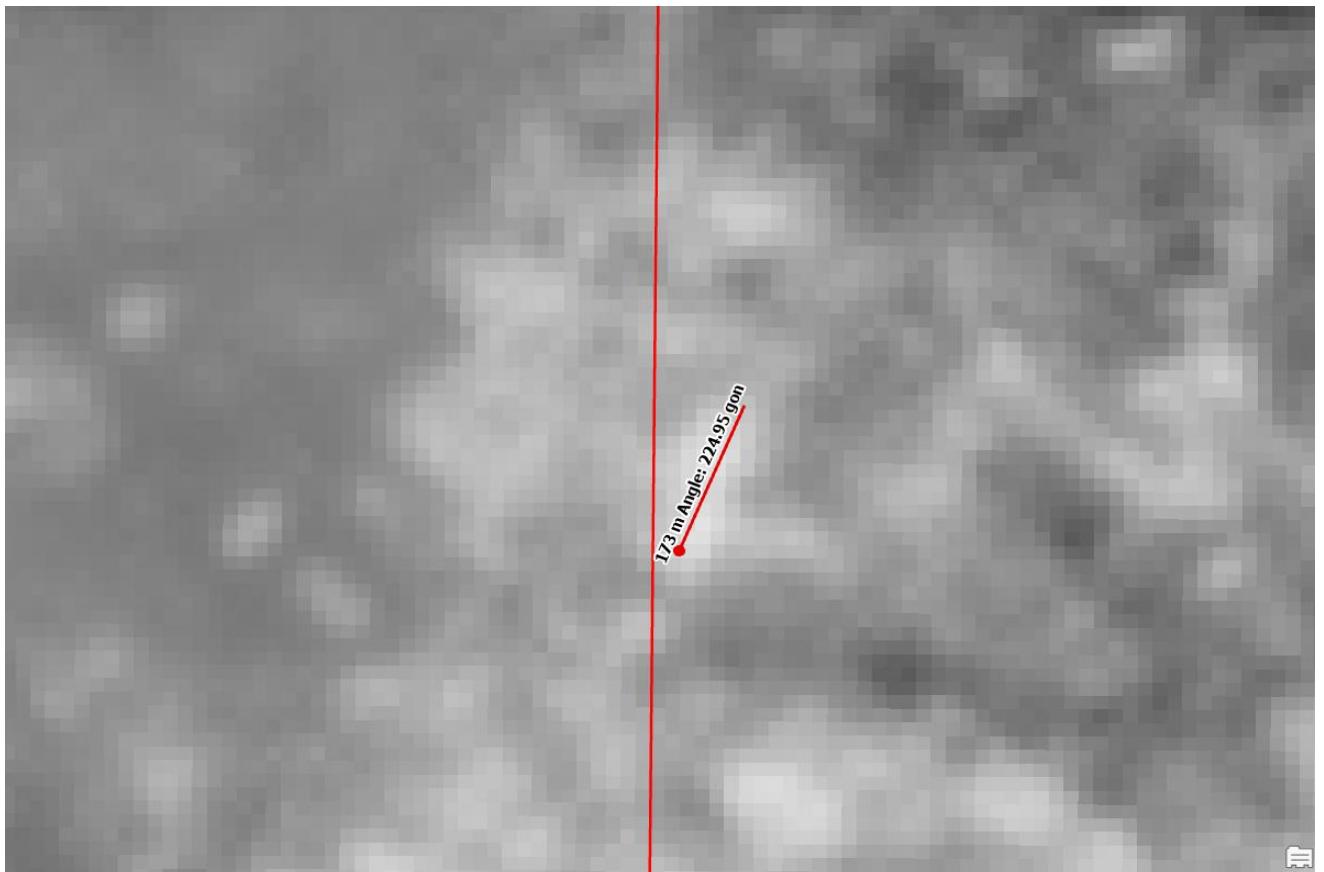
**Figure 2B**

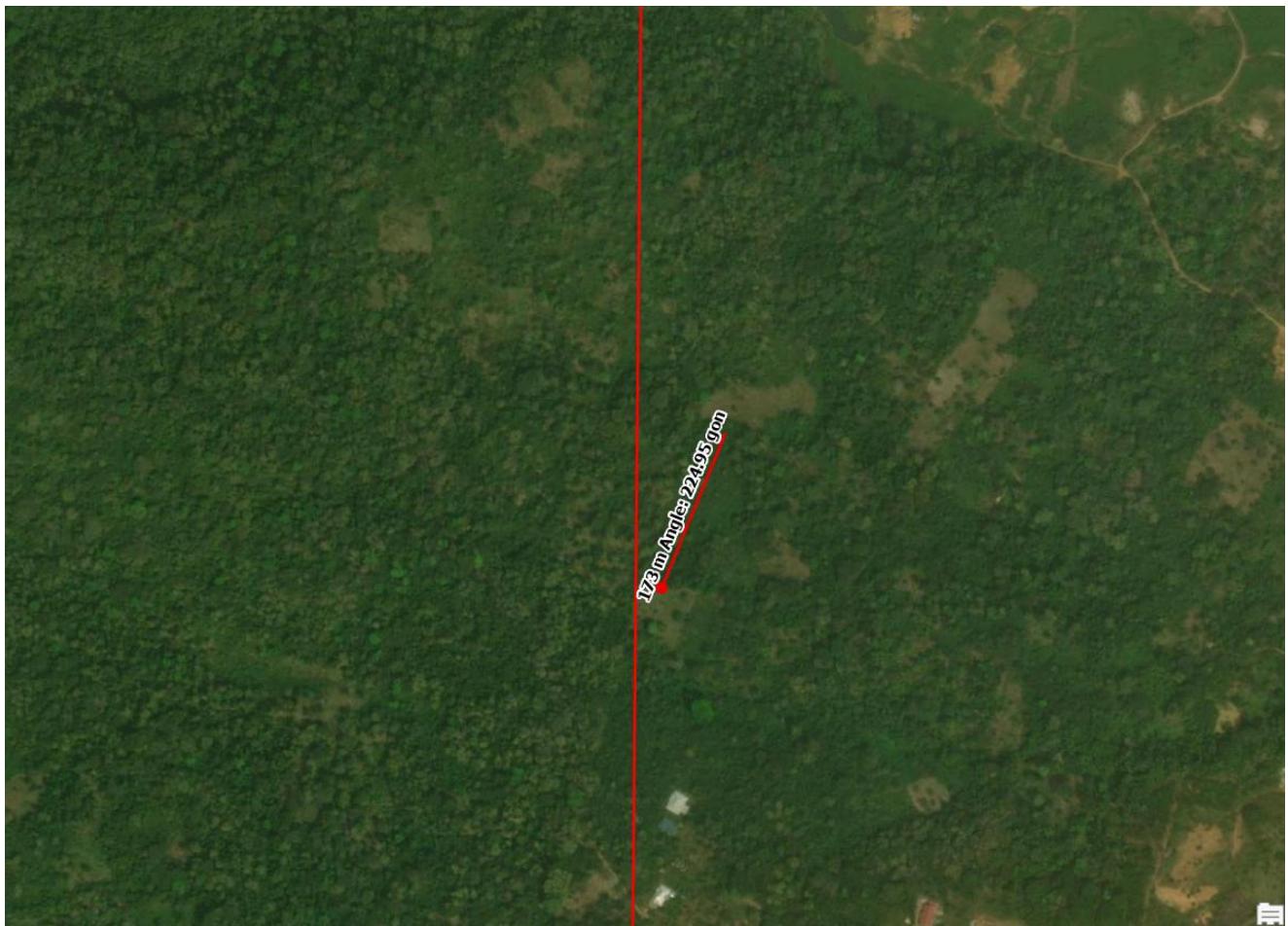


**Figure 2C**

- These red circles shown in 2A,2B,2C indicate the high values of iron oxides in north part of our study area , the white color output in 2A,2B mean iron oxides (hematite, goethite) altered to gold mineralization
- Rationale (1650 nano meter , SWIR) has high reflectance, while (650 nano meter, Red) captures iron oxide absorption. High values highlight iron-rich areas.
- The coordinate for each place have high value of iron oxides altered to gold (north part)
  1. 6.2420632°N 0.5245782°W

<https://maps.app.goo.gl/9emPz36tL4joyMbr9>





2. 6.24403931,-0.50367569

<https://maps.app.goo.gl/c6gJyvzXohgz4gGY7>

3. 6.24835927,-0.50554925

<https://maps.app.goo.gl/fVQ5rPeke3RG7qwV9>

4. 6.24166803,-0.51401746

<https://maps.app.goo.gl/u5QpYJuPFbCv1K3j7>

5. 6°14'54.6"N 0°30'58.0"W

<https://maps.app.goo.gl/wHP4X24HJrzXvYe16>

6. 0.5199279°W 6.2431489°N

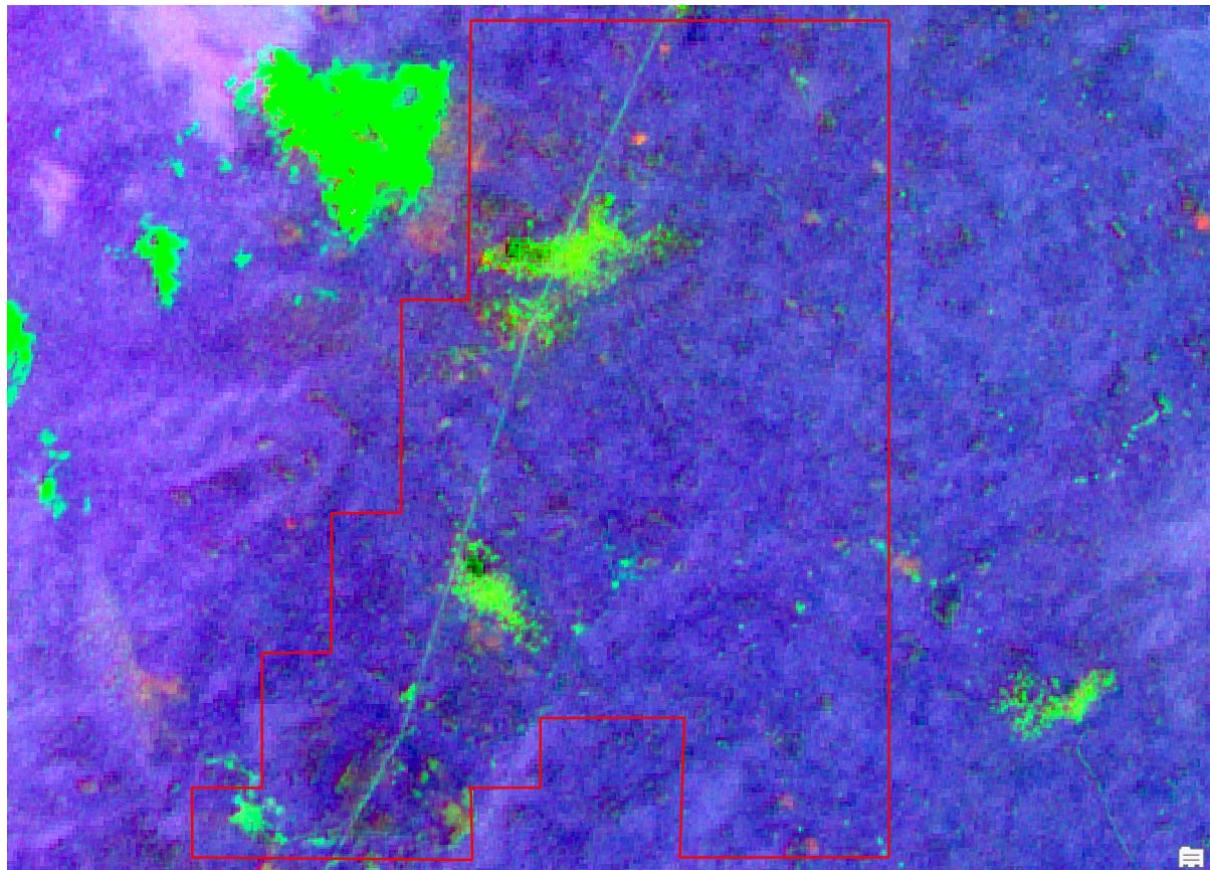
<https://maps.app.goo.gl/w3pBNBCUC7Suc18k9>

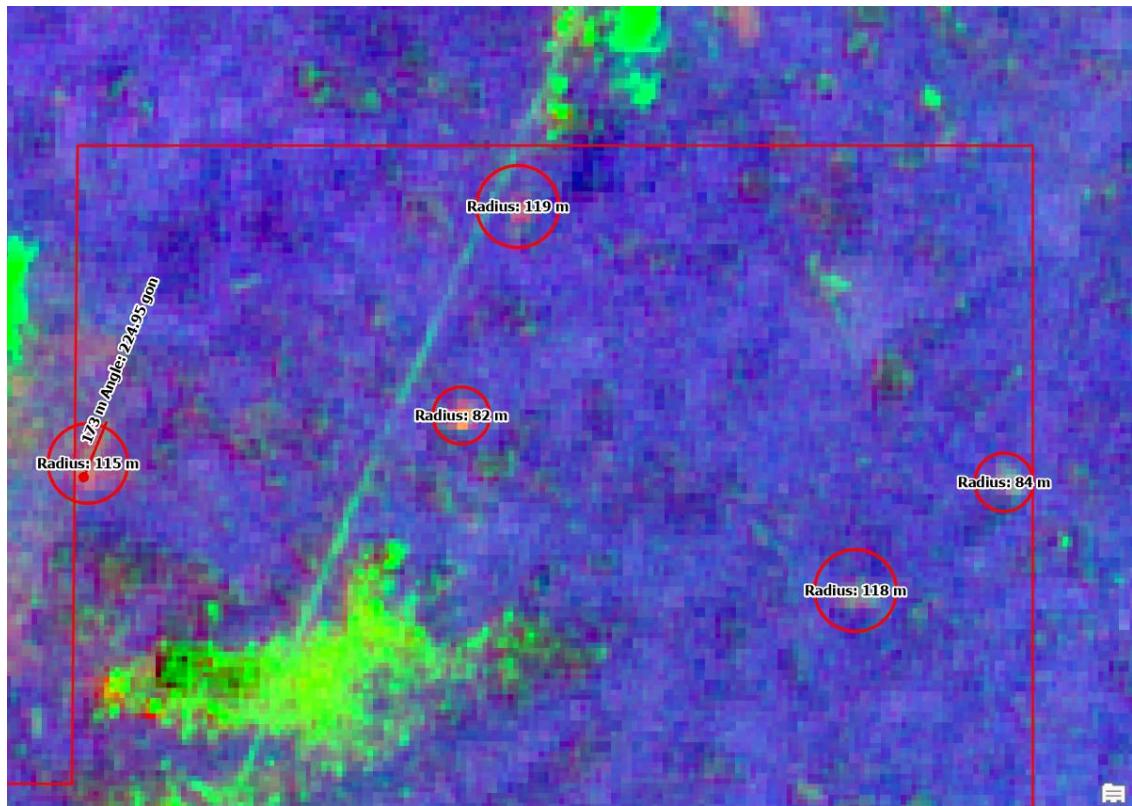
7. 0.5201473°W 6.2420132°N

<https://maps.app.goo.gl/Xe6tx1PaWXawb8iPA>

## Second technique

This technique highlights alteration minerals by isolating their spectral contrasts in higher-order, we focus on configurations that target iron oxides, Al-OH, and Mg-OH minerals, tailored to the Ashanti Gold Belt's geology.



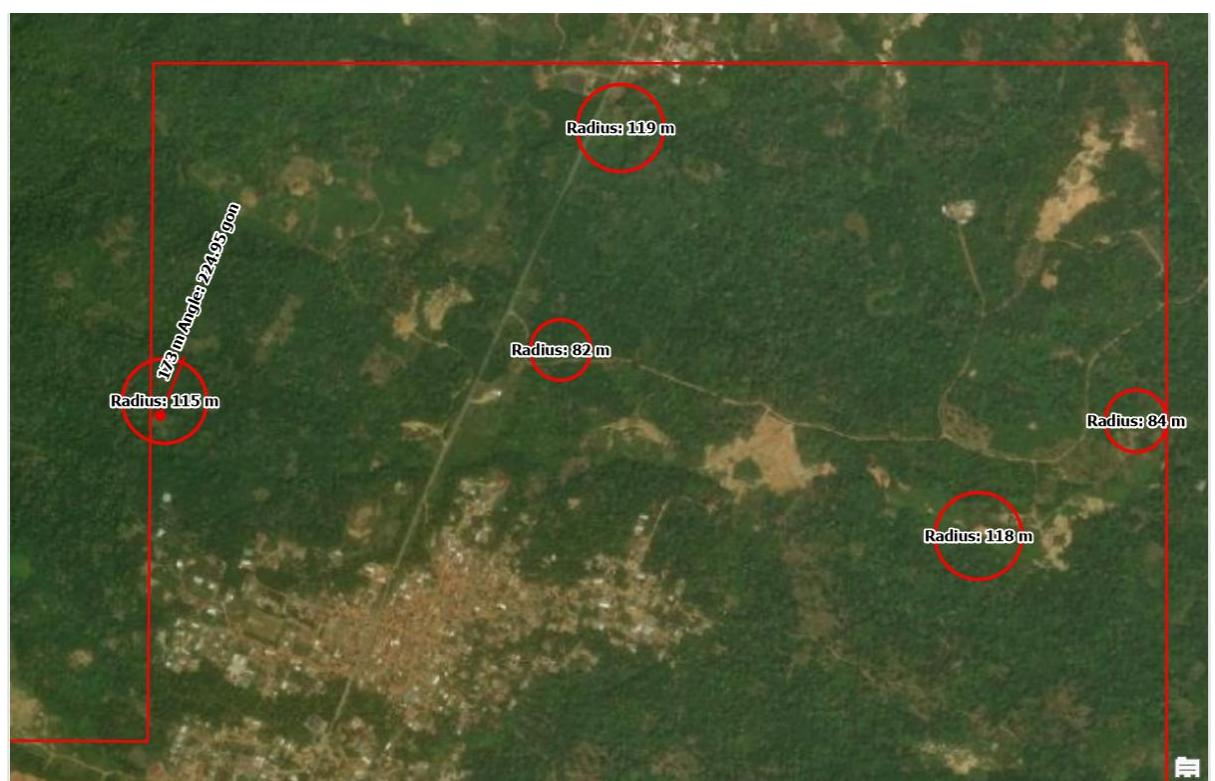
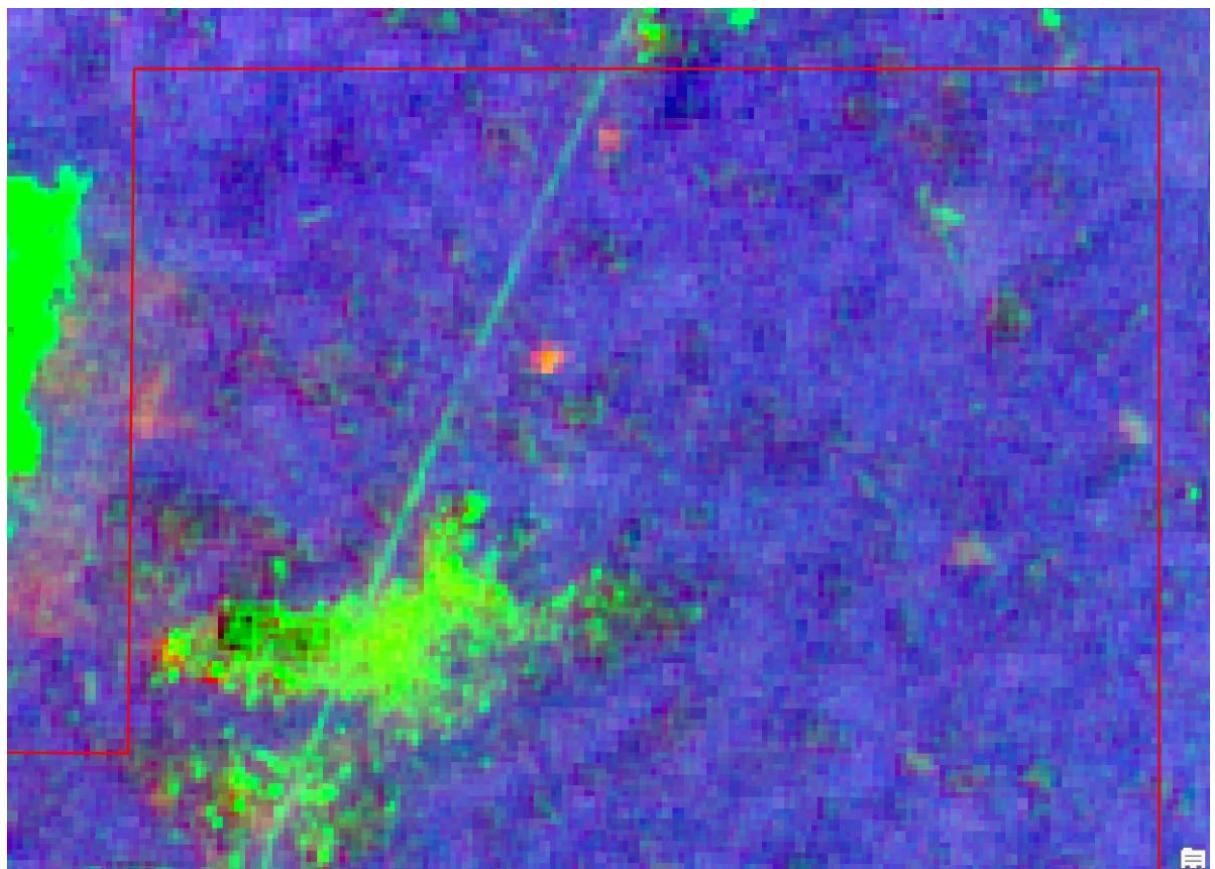


**Al-OH(phyllic/argillic) altered to gold – red**

**Mg-OH (propylitic zones) altered to gold – reddish white**

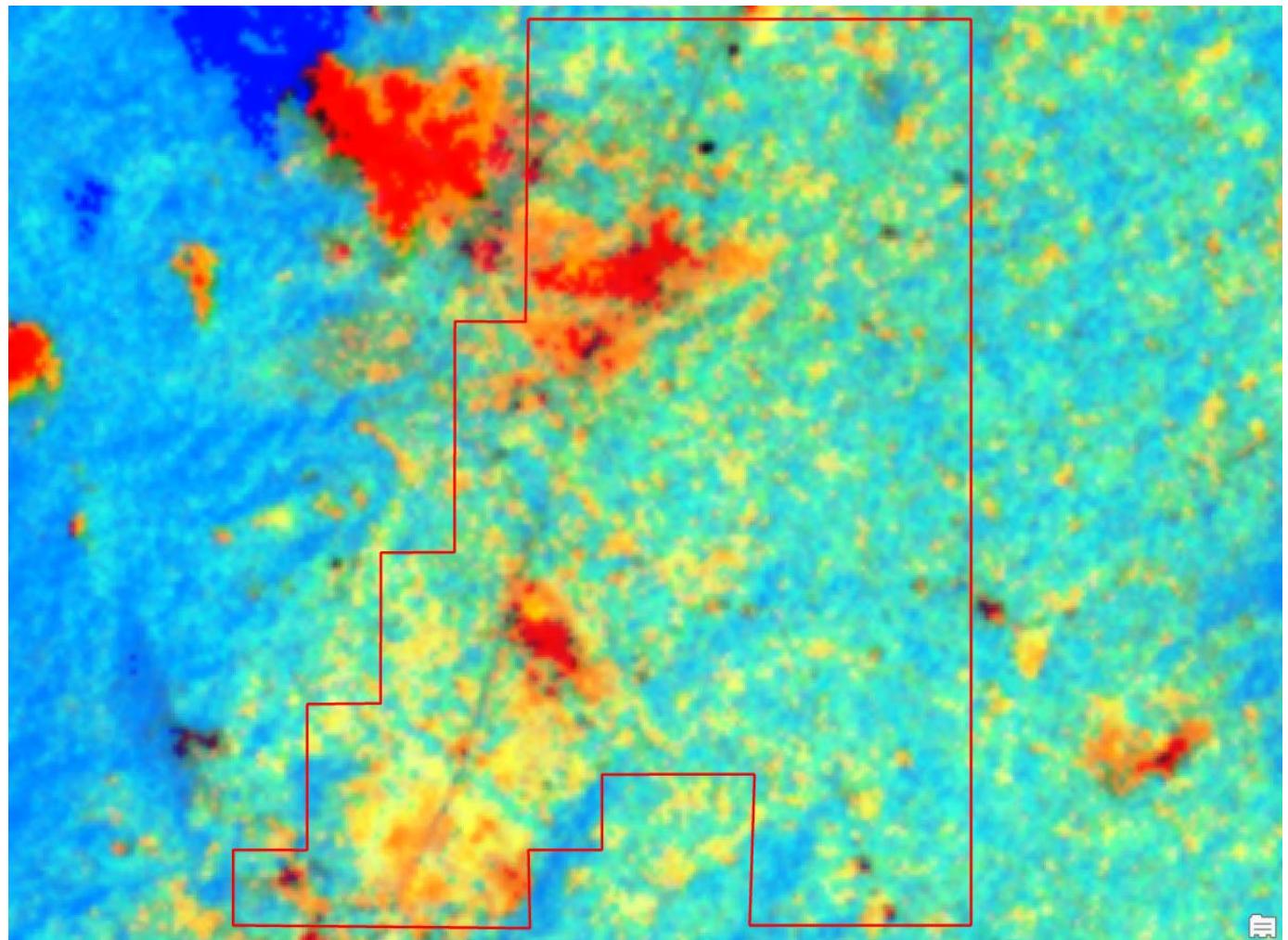
**Coordinate:**

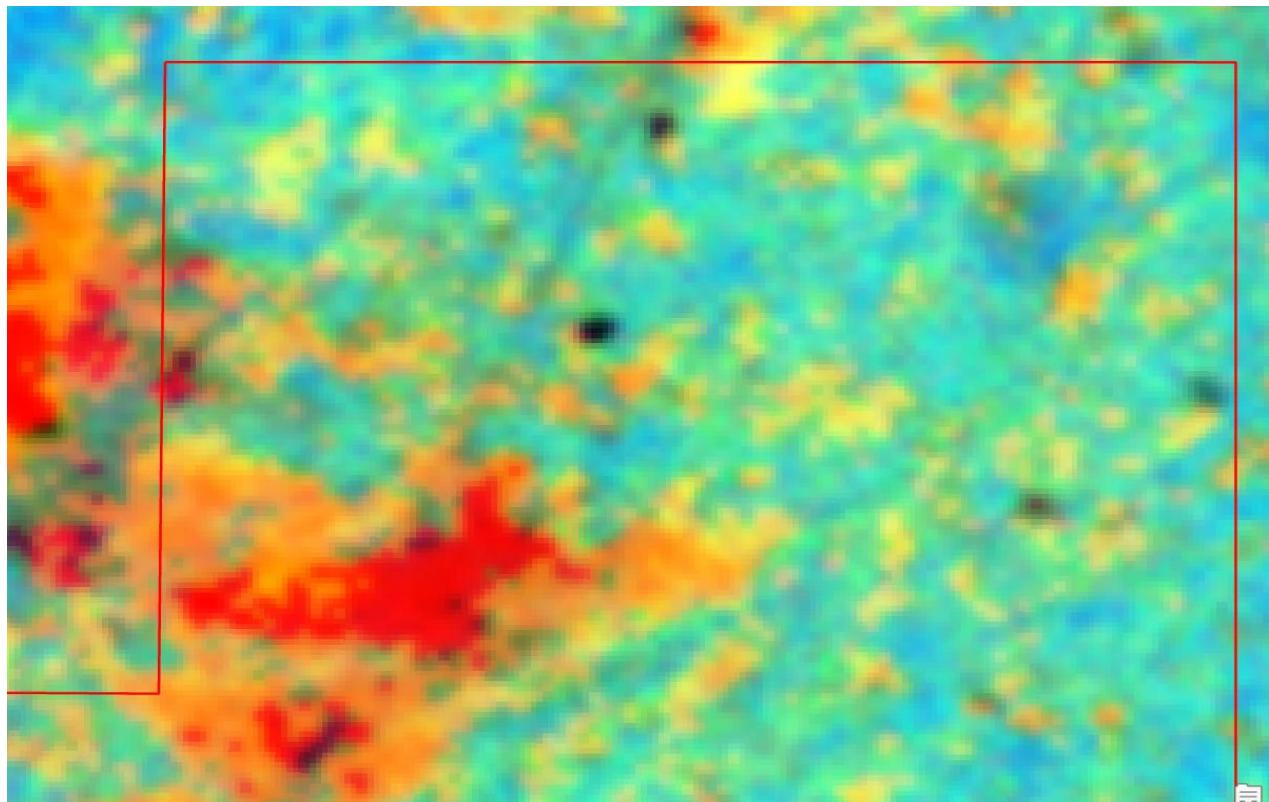
- |                         |   |
|-------------------------|---|
| 0.5247597°W 6.2417506°N | <a href="https://maps.app.goo.gl/qdF8gR6ecapFKqyZ6">https://maps.app.goo.gl/qdF8gR6ecapFKqyZ6</a> |
| 0.5133845°W 6.2482856°N | <a href="https://maps.app.goo.gl/S8WCJ5HPySWEsU12A">https://maps.app.goo.gl/S8WCJ5HPySWEsU12A</a> |
| 0.5149187°W 6.2429908°N | <a href="https://maps.app.goo.gl/CtZT3N1mChAxBwWH6">https://maps.app.goo.gl/CtZT3N1mChAxBwWH6</a> |
| 0.5045372°W 6.2383607°N | <a href="https://maps.app.goo.gl/MT1Z5TVTxy2wamrP8">https://maps.app.goo.gl/MT1Z5TVTxy2wamrP8</a> |
| 0.5005815°W 6.2413033°N | <a href="https://maps.app.goo.gl/Lsijj3EXAGX5zksT7">https://maps.app.goo.gl/Lsijj3EXAGX5zksT7</a> |



**Last stage** apply technique Capture all alteration types when geology is complex or unclear like our situation.

- After apply complex equation the output results as shown below

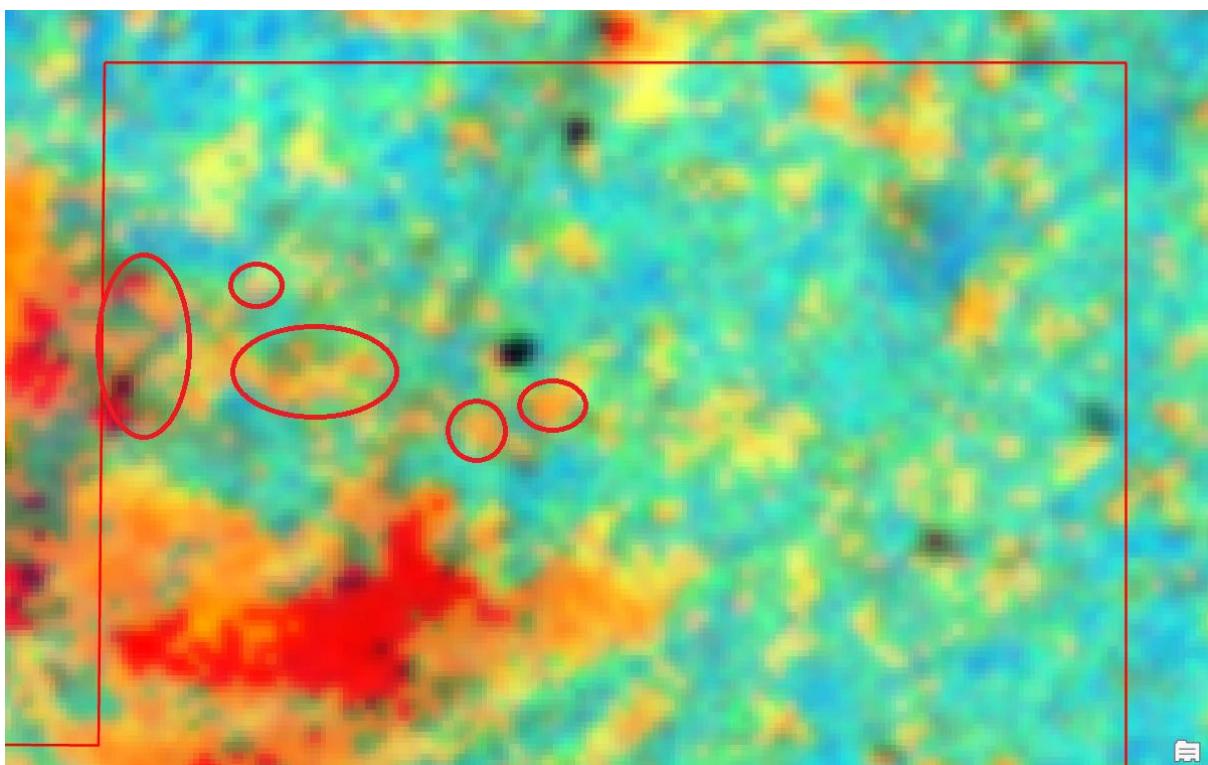
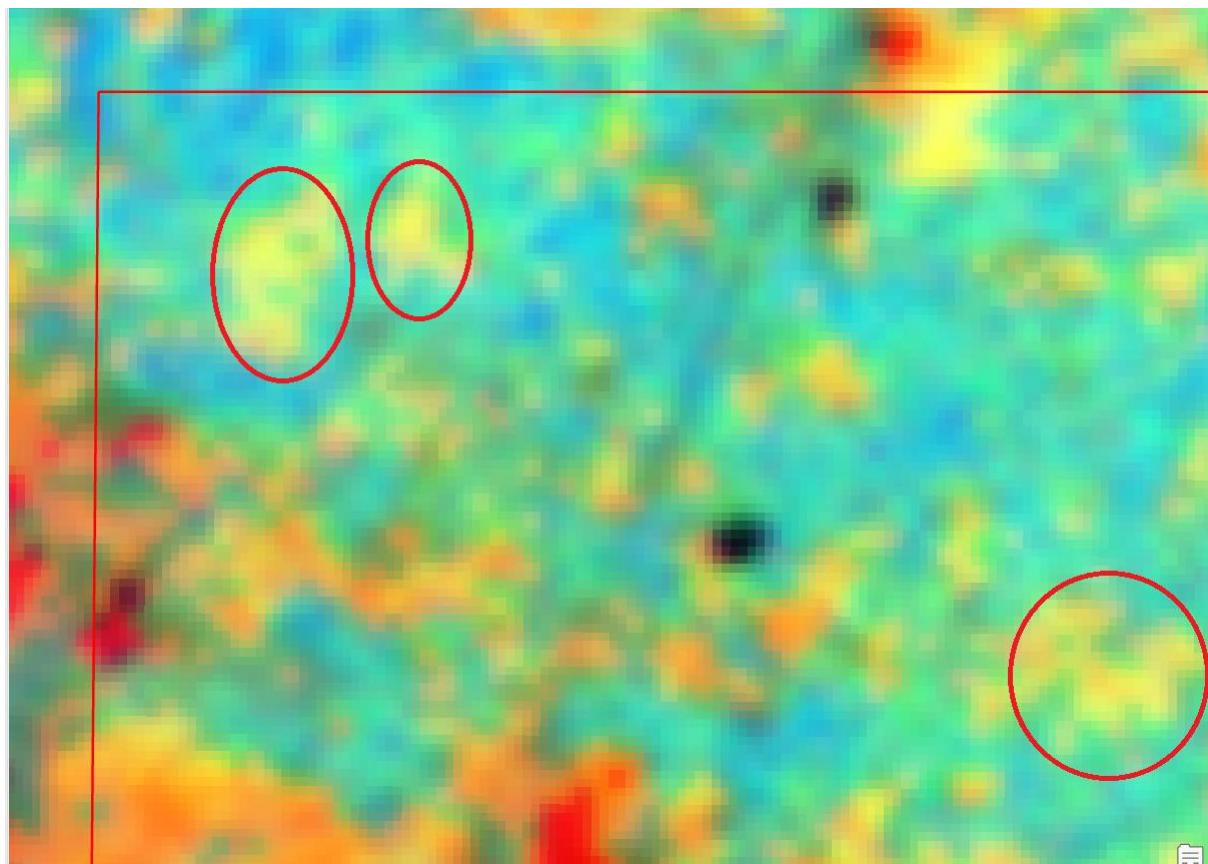




- black pixels indicate Al,Mg-OH minerals altered to gold
- red pixels not important
- **orange yellowish pixels potential gold area**
- **yellow pixels indicate potential gold area (highest level)**

**you can download the kmz file for the last stage (north part ) from here , but the resolution will be not like here in my pc**

[https://drive.google.com/file/d/17sVgjDs0-2BYpMIAqmVJnkThIVexaHFw/view?usp=drive\\_link](https://drive.google.com/file/d/17sVgjDs0-2BYpMIAqmVJnkThIVexaHFw/view?usp=drive_link)

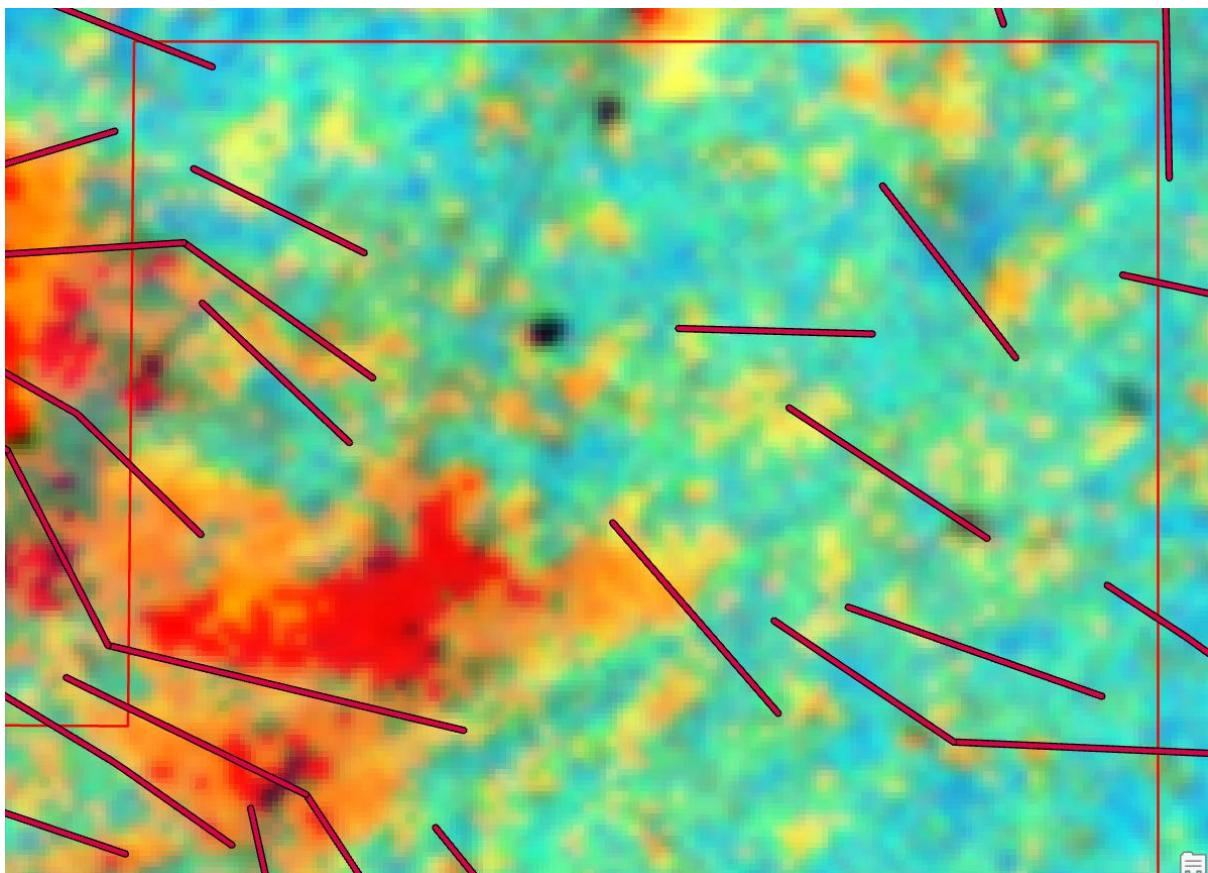


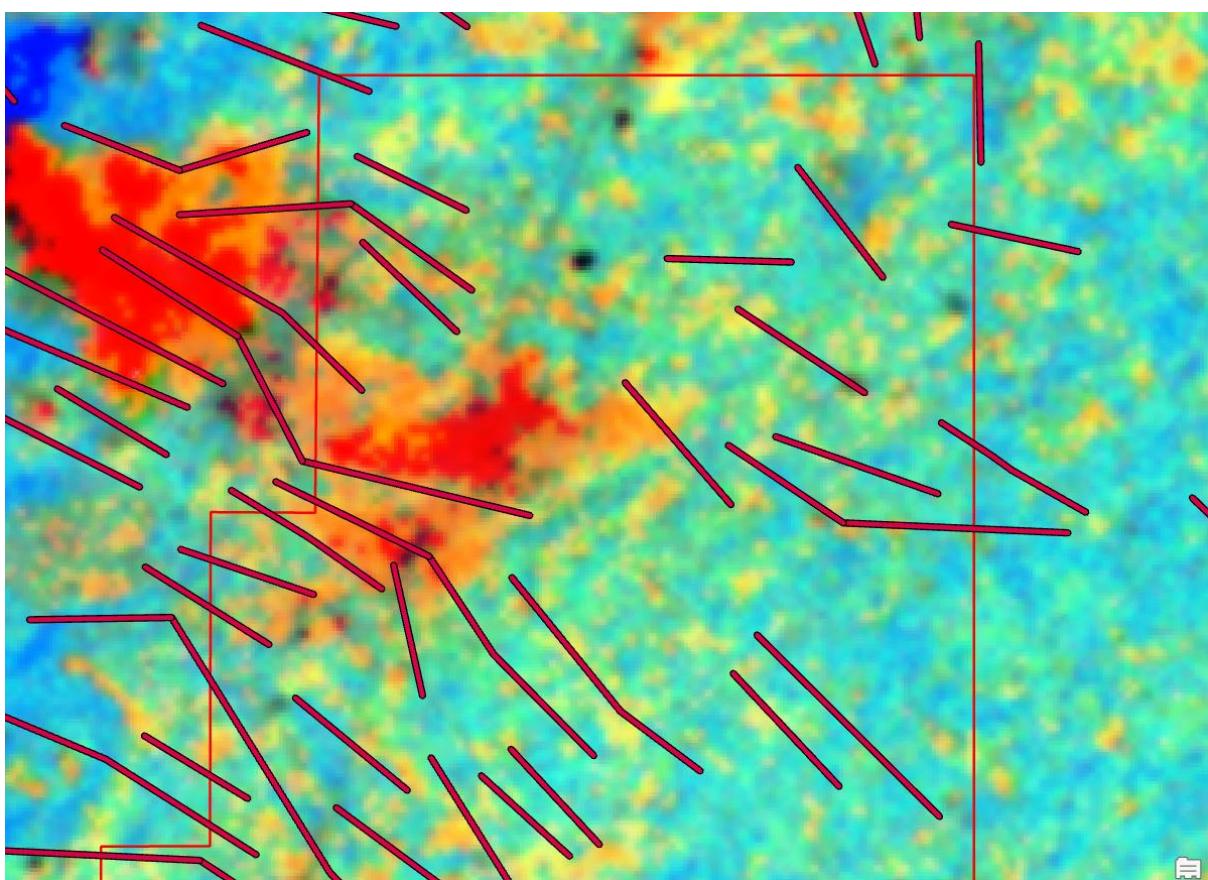
**linear geological features such as faults, fractures, or shear zones**

Combine remote sensing techniques that highlight both structural features and hydrothermal alteration minerals linked to gold. Lineaments are critical in orogenic gold deposits like those in the Ashanti Gold Belt, as they often control gold mineralization by acting as conduits for hydrothermal fluids, leading to alteration zones rich in minerals such as sericite, kaolinite, chlorite, and iron oxides (hematite, goethite). The goal is to identify lineaments that spatially correlate with these alteration zones, indicating potential gold-bearing structures.









**The red lines interact with minerals altered to gold give us a strong confirmation of gold zones , the reason of that because these lines represent tectonic faults near gold .**

In conclusion, the successful detection of gold-related features requires a specialized background in remote sensing with a strong foundation in geological principles

Expertise in identifying structural features like NE-SW and NW-SE trending shear zones, which are critical for gold mineralization, along with the ability to interpret spectral signatures of minerals such as hematite, sericite, and kaolinite, is essential

Therefore, a robust remote sensing background combined with geological expertise is indispensable for effectively detecting and validating gold-related lineaments and alteration zones, ensuring reliable exploration outcomes.