# El Gordo breakdown – quartz vein?

*Simon Cornhill and Diane Arthurs observations*

– responses from Claude AI to prompts by Juan Corrin, 3/11/2025

*JC: In the same chamber roof, there is a 30cm wide white(ish) mineral vein. What mineral(s) could this be made of?*

Excellent observation! A 30cm-wide vein is quite substantial and provides important clues about both the geological history and potentially the chamber's stability. Here are the most likely candidates:

## Most Probable: Calcite ($CaCO_3$)

**Why this is most likely:**

- Extremely common in limestone-bearing sequences
- Forms readily from calcium-rich hydrothermal fluids circulating through fractures
- Pure calcite is bright white to translucent
- The Cantabrian region has extensive carbonate sequences with calcite veining
- 30cm width indicates significant, prolonged fluid flow through a major fracture

**Field identification:**

- Reacts with dilute HCl (fizzes)
- Can show rhombohedral crystal structure
- May be translucent or milky white
- Could show "dog-tooth" crystal terminations if void space existed
- Hardness ~3 (scratches with knife)

## Second Most Likely: Quartz ($SiO_2$)

**Why this is probable:**

- Common in sandstone sequences (silica-rich fluids)
- Milky/white quartz forms from hydrothermal solutions
- Very resistant to weathering (would stand out in relief if surrounding rock weathered)
- Can fill major fault/fracture systems

**Field identification:**

- Very hard (7 on Mohs scale - scratches glass, not scratched by knife)
- No reaction to acid
- May show conchoidal fracture
- Could be massive or show crystal faces
- Often has a slightly glassy or sugary texture

## Other Possibilities:

**Dolomite [$CaMg(CO_3)_2$]**

- Common in mixed carbonate sequences
- White to cream/buff colored
- Reacts weakly with cold dilute HCl (more vigorous when powdered or with hot acid)
- Often associated with limestone/dolomite transitions
- Hardness 3.5-4

**Gypsum ($CaSO_4 \cdot 2H_2O$)**

- Less likely in this setting, but possible
- Soft (hardness 2 - scratches with fingernail)
- Often fibrous or crystalline texture
- Can be white to translucent
- No acid reaction
- Would likely show weathering/dissolution in cave environment

**Barite ($BaSO_4$)**

- Less common, but Cantabria has some hydrothermal mineralization
- Unusually heavy/dense for its appearance
- White to cream colored
- Hardness 3-3.5
- No acid reaction

# Geological Significance:

The vein represents:

- **A major fracture or fault** that acted as a fluid conduit
- Likely formed during tectonic activity (Variscan or Alpine orogenies affected Cantabria)
- Hydrothermal fluids depositing minerals from solution
- This fracture may have been a precursor to cave development

# Critical Stability Implications:

This vein is highly relevant to your rockfall concerns:

**If it's Calcite:**

- **Contact zones** between vein and host rock are often weak
- The vein itself may dissolve faster or slower than surrounding limestone
- Could create a plane of weakness for block detachment
- If the vein crosses bedding planes, it might bind them together (stabilizing) or provide a failure path (destabilizing)

**If it's Quartz:**

- Much harder and more resistant than limestone or sandstone
- Creates **differential weathering** - surrounding rock recedes, vein protrudes
- Can act as a "pin" holding blocks together OR create stress concentrations
- The vein-rock contact is often a weakness plane

**Either way:**

- A 30cm vein indicates a **major structural discontinuity**
- The fracture it filled may extend beyond the visible vein
- This could be a **block boundary** - blocks on the floor might be bounded by this vein/fracture
- Weathering at the vein contacts could contribute to the particle "rain"

# Diagnostic Tests You Could Perform:

1. **Hardness test**: Try scratching with a knife
    - Scratches easily = calcite, gypsum, or dolomite
    - Doesn't scratch = quartz
2. **Acid test**: Drop of vinegar or dilute HCl
    - Vigorous fizzing = calcite
    - Weak fizzing = dolomite
    - No reaction = quartz, gypsum, or barite
3. **Heft test**: If you can handle a piece
    - Unusually heavy = barite
    - Normal weight = others
4. **Weathering pattern**: Look at how it behaves relative to host rock
    - Stands proud (protrudes) = likely quartz
    - Recessed/dissolved = likely calcite or gypsum
    - Similar weathering = less diagnostic

# Most Likely Scenario:

Given the interbedded limestone-sandstone in Cantabria, I'd put my money on **calcite as the primary constituent**, possibly with some **quartz** inclusions or zonation. The white color and 30cm width are classic for calcite-filled fractures in carbonate terranes.

**The presence of this vein adds another dimension to the failure analysis**: it represents a major structural feature that likely influences how and where blocks detach from the ceiling. If the particle "rain" is concentrated near or below this vein, it could indicate the vein-rock contacts are actively weathering and separating.

Can you tell if the vein appears to be harder or softer than the surrounding rock? Does it stand out in relief, or is it recessed?