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Glacial Geomorphology

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Glacial Deposits and Depositional Landforms

- Stratified Drift Deposits (Glaciofluvial Landforms)

Outwash (Sandur)

Kettle

Esker

Kame

Varv

- Ice-contact Deposits and Related Landforms

Till

Moraine

Drumlin

Glacial Deposits and Depositional Landforms

Glacial Drift

As a glacier moves slowly across the land, it picks up material from the underlying rocks and incorporates it into the ice. When the glacier melts, this material is deposited elsewhere. Through this process, the glacier shapes the landscape by both eroding and depositing sediments. The debris resulting from glacial activity is collectively known as **glacial drift**.

Glacial drift refers to all sediments transported and deposited by a glacier or its meltwater. This term broadly covers materials that vary in size, composition, and how they are deposited. Glacial drift is generally divided into two main types:

1.Till: When the debris is deposited directly by the glacial ice without sorting, it is referred to as **glacial till**, a heterogeneous mix of boulders (large rocks), gravel, sand, silt, and clay.

2.Stratified drift: Debris that has been transported, sorted and layered by meltwater from a glacier is called **stratified drift**. While stratified drift can vary in grain size, its sorting is significantly better than that of glacial till.

Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Outwash (Sandur)

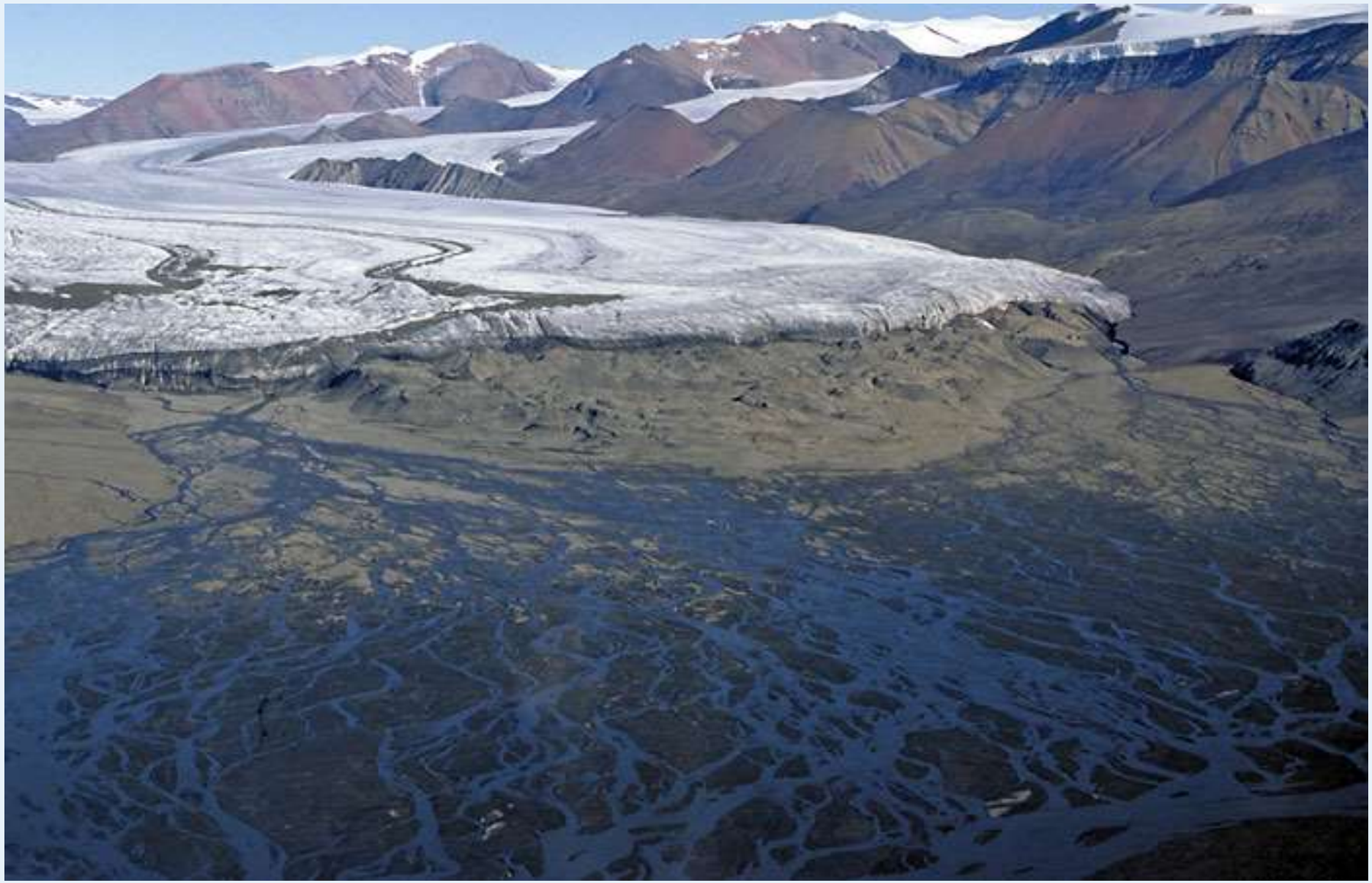
In proglacial settings, where meltwater streams transport large volumes of sediment, outwash fans are common. These fans, known as sandur in Icelandic, form as sediment is deposited in areas where meltwater flow decreases in velocity and its capacity to carry sediment diminishes. Outwash fans can vary greatly in size, extending from the ice front for tens of meters to several kilometers. Their gradient typically reflects sediment grain size, with **coarser material** deposited closer to the ice and **finer material** spreading further out. These fans are often dotted with kettle holes, which form when buried ice blocks melt, leaving depressions in the surface.

https://www.antarcticglaciers.org/glacial-geology/glacial-landforms/glaciofluvial-landforms/proglacial-glaciofluvial-landforms/

Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Outwash (Sandur)



https://www.coolgeography.co.uk/A-level/AQA/Year%2012/Cold%20environs/Fluvioglacial/Fluvioglacial%20landforms.htm

Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Outwash (Sandur)

Glacial Deposits and Depositional Landforms

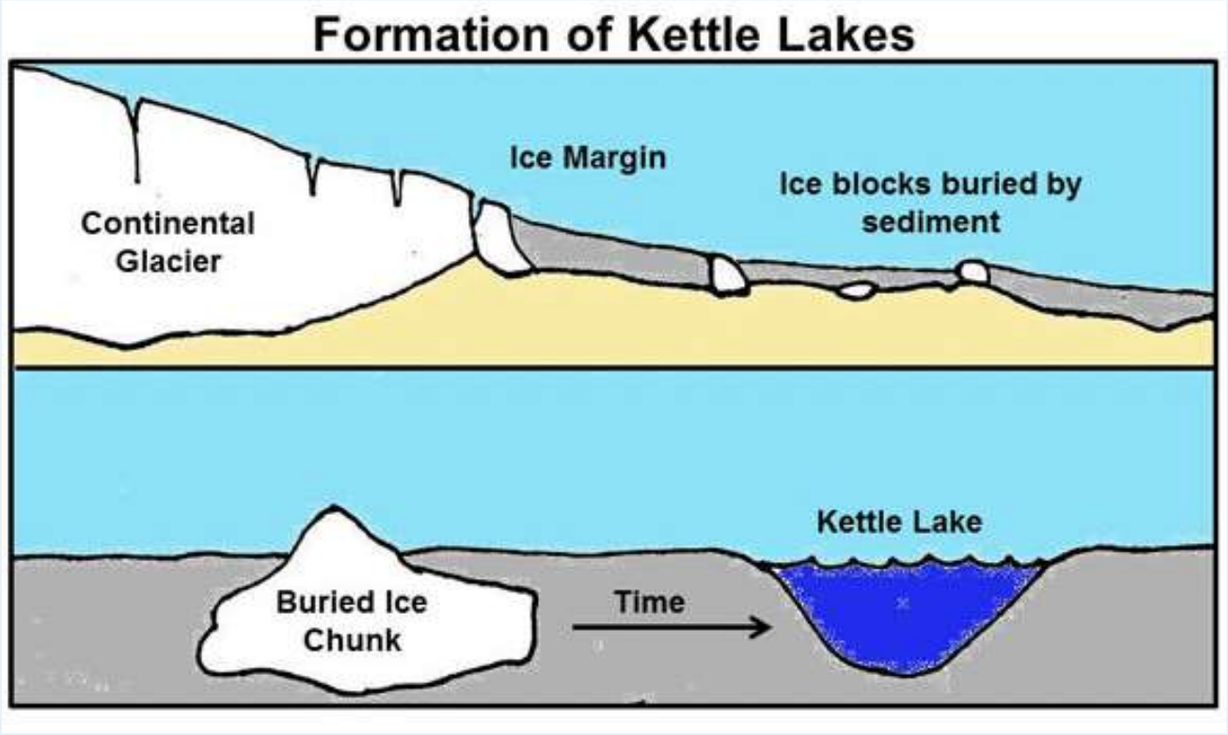
Stratified Drift Deposits (Glaciofluvial Landforms)

Outwash (Sandur)

Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Kettle, kettle lake, kettle hole



https://www.superiortelegram.com/sports/natural-connections-glaciers-and-bogs-of-the-forest-lodge-nature-trail

A kettle hole is a depression created when buried ice blocks within glaciofluvial plains melt. These ice blocks may become separated from the glacier snout due to differential melting or mechanical fracturing. As the ice blocks melt within the glaciofluvial sediments of a sandar surface, they leave behind hollows or pits, which are referred to as kettle holes.

Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Esker

Eskers, on the other hand, form as sediment accumulates in meltwater channels beneath or along the margins of an ice sheet. These ridges of sediment are essentially the remnants of water-choked subglacial or englacial drainage pathways. In some cases, eskers are found draped over drumlins, intersecting their long axes at oblique angles. Because eskers reflect the paths taken by meltwater channels rather than the flow direction of the ice itself, they often diverge from the ice flow lines. Esker ridges (Figure 9) can range from a few meters to several tens of meters in height and may extend across landscapes for distances varying from tens of meters to hundreds of kilometers.

Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Esker

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Glacial Deposits and Depositional Landforms

Stratified Drift Deposits (Glaciofluvial Landforms)

Kame

Kames and kame terraces are other features associated with glacial environments, forming primarily where terrain or slopes allow sediment deposition. Kame terraces typically develop alongside valley glaciers, with meltwater transporting sediment along the slopes that confine the glacier. These terraces often trace the slope of the valley glacier's trim line. Kames themselves are irregularly shaped mounds of glaciofluvial sediment that form when sediment accumulates in crevasses or cavities within the ice and collapses as the ice melts. They may also form in subglacial or englacial channels and often display evidence of slumping or faulting on their sides.

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Rock fragments within a glacier, known as debris, can be transported in three main ways: **supraglacial transport** on the glacier's surface, **englacial transport** within the glacier, and **subglacial transport** along the glacier bed. In subglacial transport, debris can be moved within the debris-rich basal ice layer or through any mobile, saturated, unconsolidated layer.

Glacial till is characterized by an unsorted mixture of particles of all sizes, from boulders to fine clay. As a glacier advances, it collects any material in its path, creating this diverse deposit. In geology, till refers to unsorted sediment deposited directly by glacial ice, lacking any form of stratification. It is sometimes called boulder clay because it contains clay, boulders, or a combination of both. The rock fragments in till are typically angular and sharp, as they are deposited directly from the ice without significant water transport. Pebbles and boulders within till may also show faceting and striations, a result of being ground against other materials while embedded in the moving glacier.

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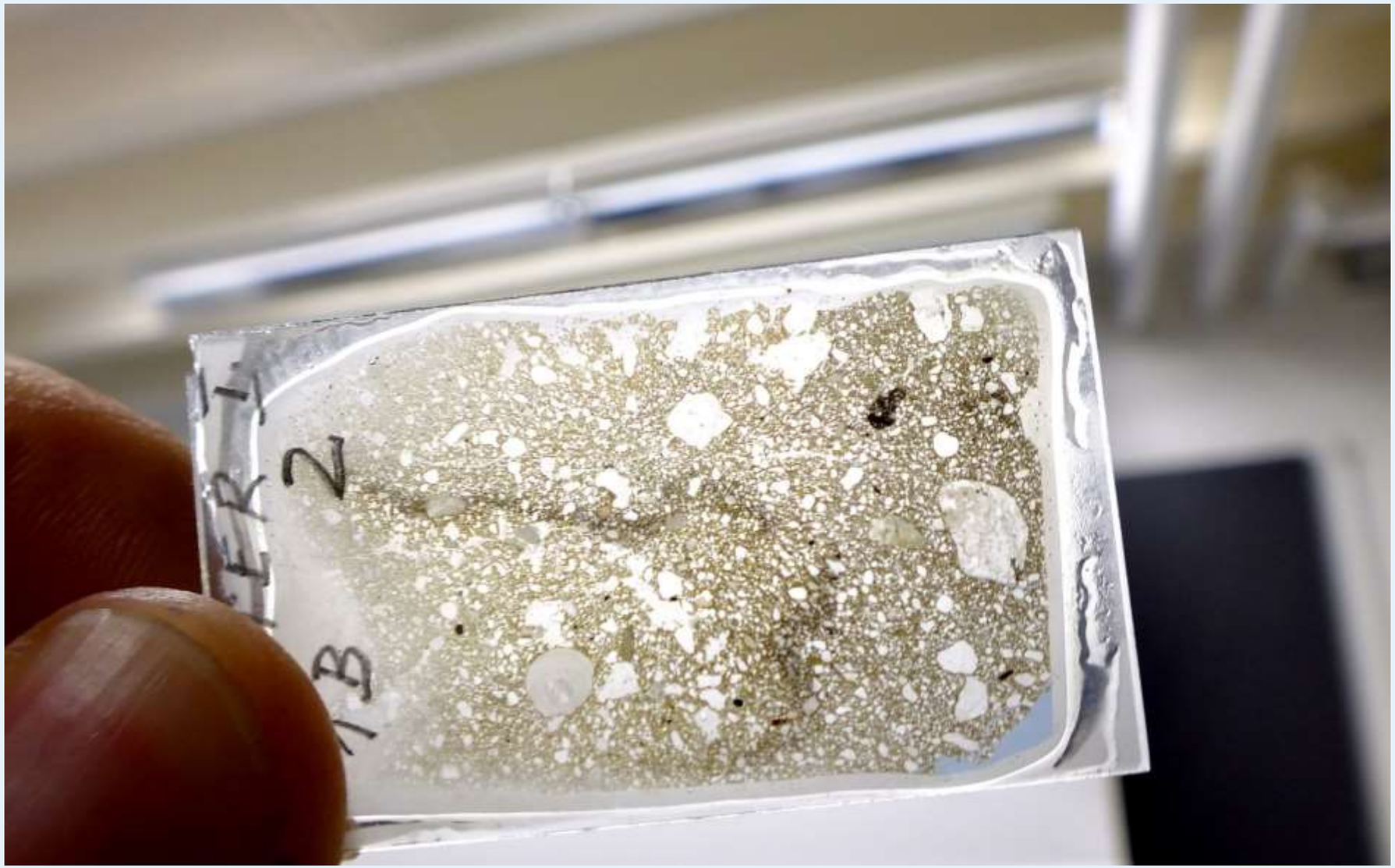
Ice-contact Deposits and Related Landforms

Till



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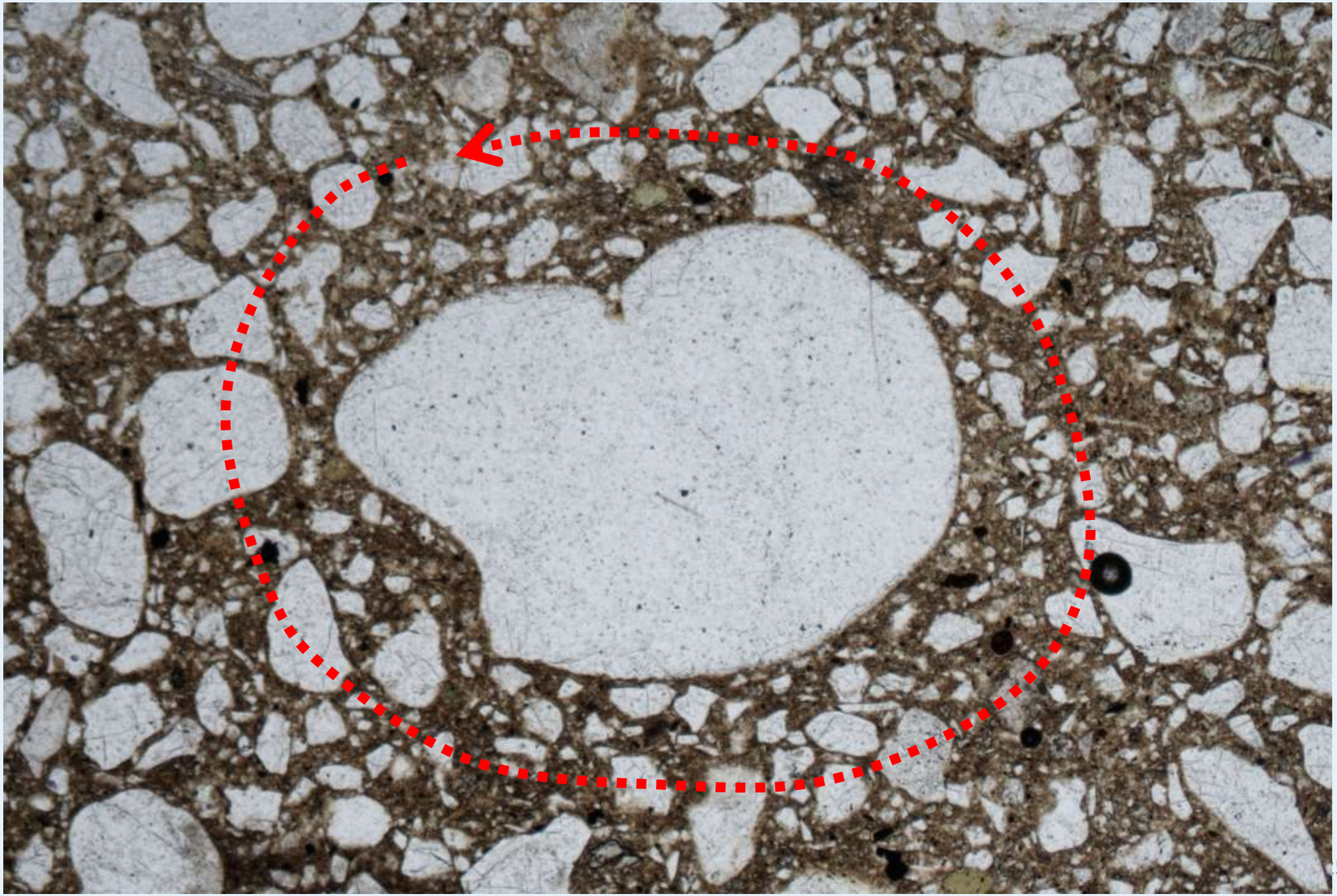

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Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Pyramides d’Euseigne

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Pyramides d’Euseigne

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Bigganjarga Tillitleri (600 ma)

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Glacial Deposits and Depositional Landforms

Ice-contact Deposits and Related Landforms

Till

Glacial cobble

Glacial Deposits and Depositional Landforms

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Till