

A Fragment of the GeoEvent Ontology



Final assignment for the
Ontology Engineering class

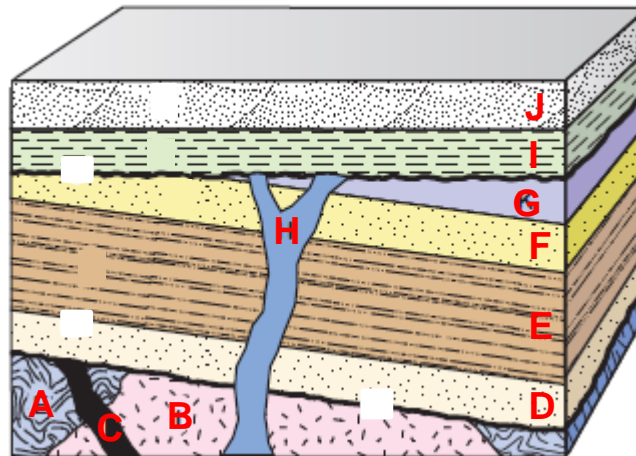
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Professor: Mara Abel

Date: 02/12/2021

Domain

The geological record is formed by a series of mesoscopic geological objects, that can be strata created by deposition events above Earth's surface, or plutons created after magma solidifies under surface. These geological objects (strata and plutons) are constituted by sediments or rock. Rocks can be divided into three main types, sedimentary, igneous, or metamorphic, based on the processes that created them; they also can be classified in clastic or crystalline rocks, based on their primary components. Each of these objects is related to neighbors, and by recognizing the nature of these relationships it is possible to infer the relative age of the events that created the geological objects. Strata are created by deposition and in this event, they overlie one or more objects, creating a depositional contact with them. Plutons are created by intrusion, creating an intrusive contact with the host objects around itself.



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- Ontologies used
 - Endurants and relations
 - Application
 - Events



Ontologies used

OntoUML

Guizzardi, G. (2005). Ontological foundations for structural conceptual models.

gUFO – A lightweight implementation of UFO, available in OWL.

<https://nemo-ufes.github.io/gufo/>

Geo Core Ontology – GCO

Garcia, L. F., Abel, M., Perrin, M., & dos Santos Alvarenga, R. (2020). The GeoCore ontology: A core ontology for general use in Geology. *Computers & Geosciences*, 135, 104387.

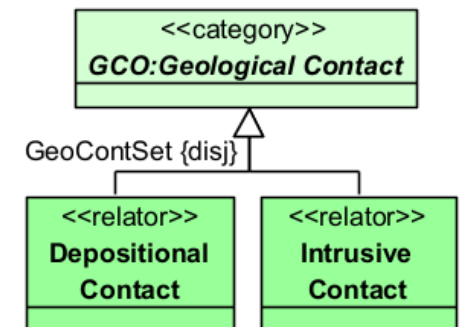
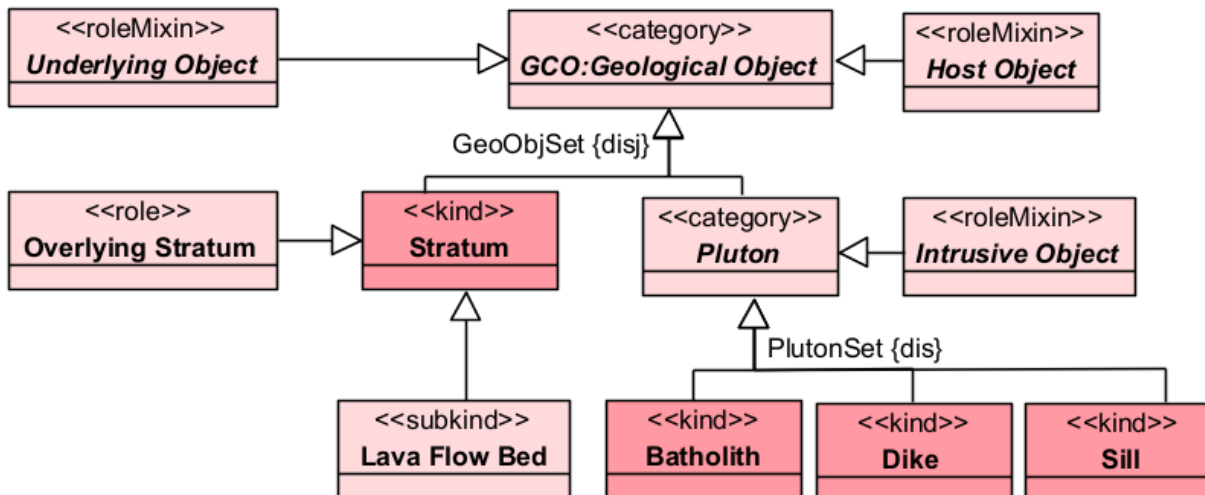
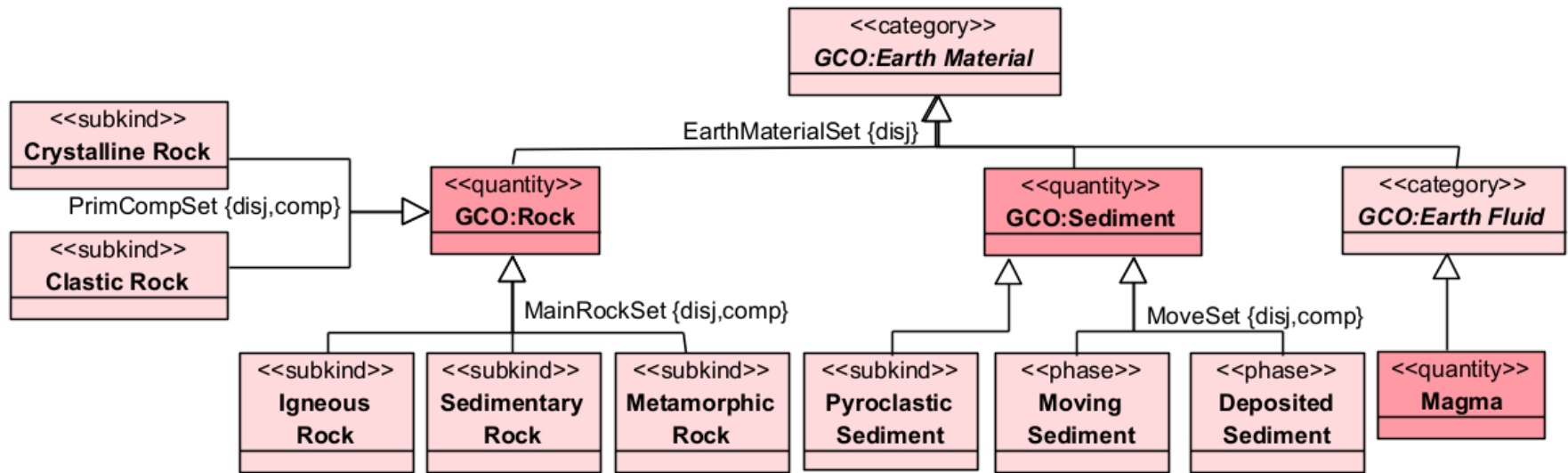
Geological Spatial Relation Ontology – GSRO

Cicconeto, F., Vieira, L. V., Abel, M., dos Santos Alvarenga, R., Carbonera, J. L., & de Janeiro–RJ–Brazil, R. (2020). A Spatial Relation Ontology for Deep-Water Depositional System Description in Geology. In *ONTOBRAS* (pp. 35-47).

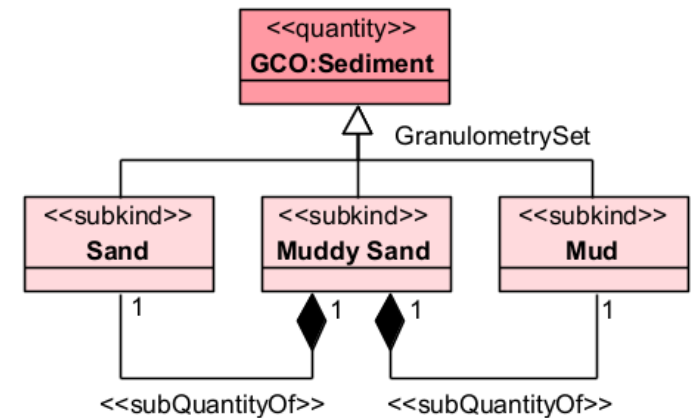
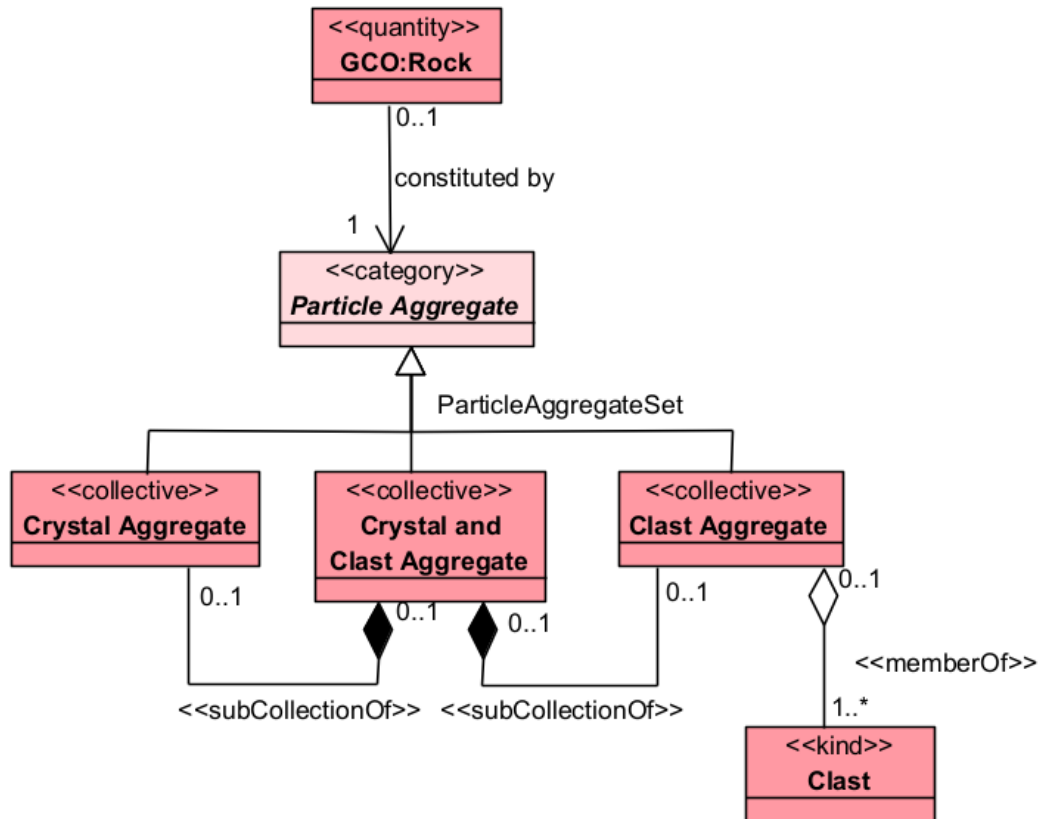


Endurants and relations

Taxonomy of Endurants

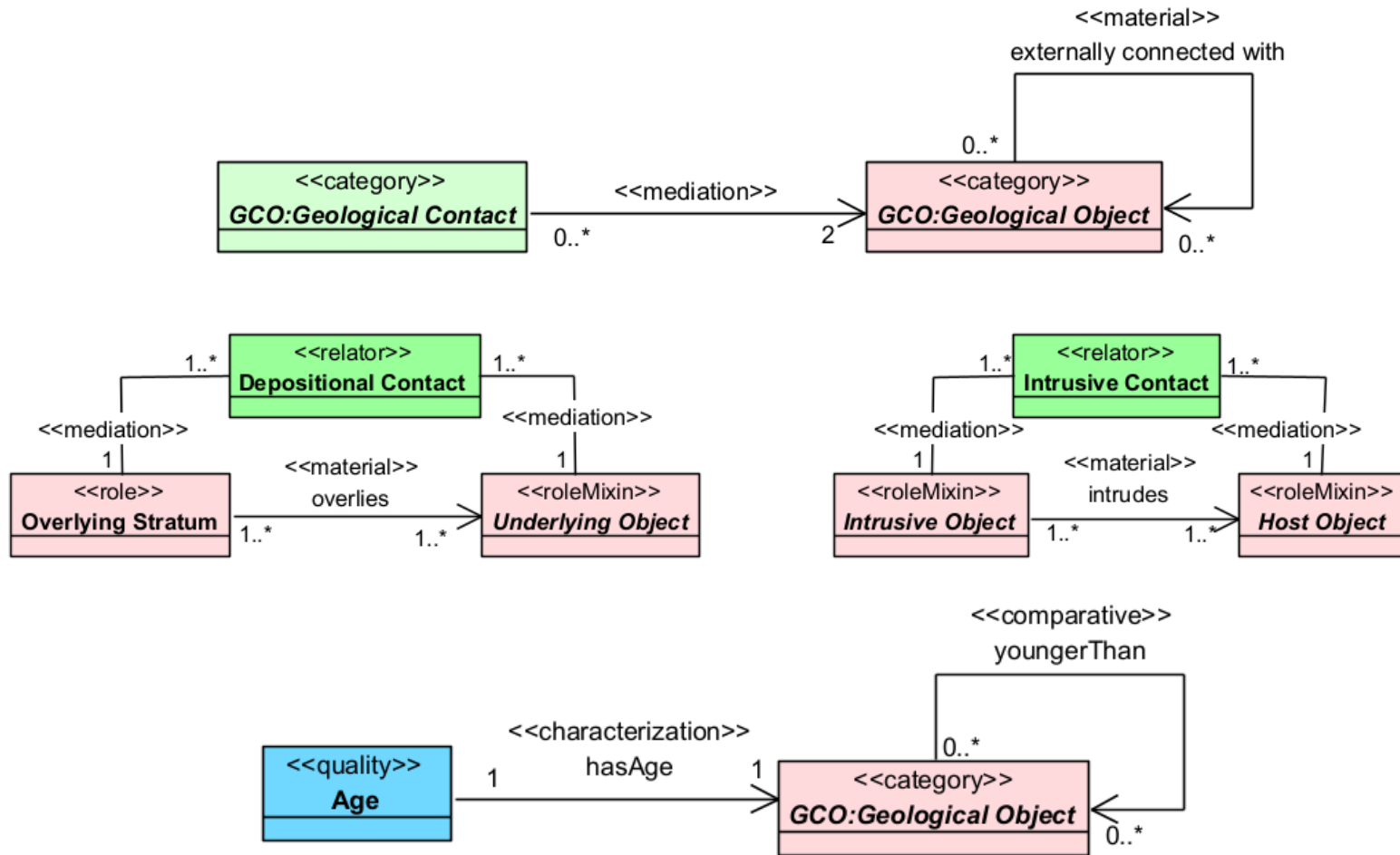


Some mereologic relations





Relators



Principle of Superposition

$$\forall x, y (x :: \text{OverlyingStratum} \wedge y :: \text{UnderlyingStratum} \implies \text{youngerThan}(x, y))$$

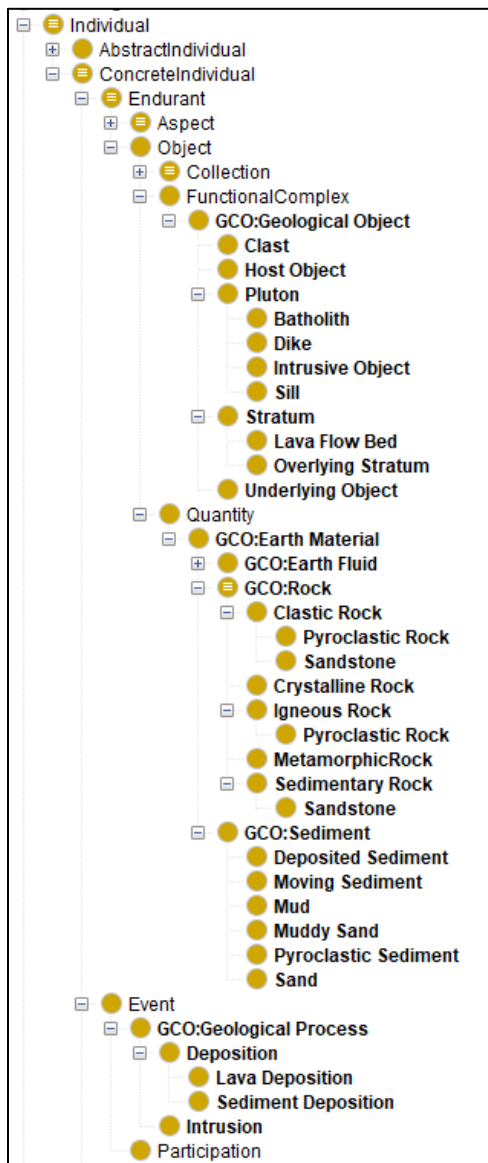
$$\forall x, y (x :: \text{IntrusiveObject} \wedge y :: \text{HostObject} \implies \text{youngerThan}(x, y))$$



Application



Protege



Class Hierarchy

Annotations: Pluton

Annotations +

`rdfs:label` [language: en]

Pluton

`rdfs:comment` [language: en]

Pluton is a geological object that is created by an intrusion and it is constituted by crystalline igneous rock

`exampleOfUse` [language: en]

The Kozak pluton is located in central western Anatolia, where it crops out in the core of an antiformal culmination. The pluton was emplaced into regionally deformed and metamorphosed basement rocks, during the Late Oligocene-Early Miocene period.

`source` [language: en]

Winter, J. D. (2014). Principles of igneous and metamorphic petrology (Vol. 2). Harlow, UK: Pearson education.

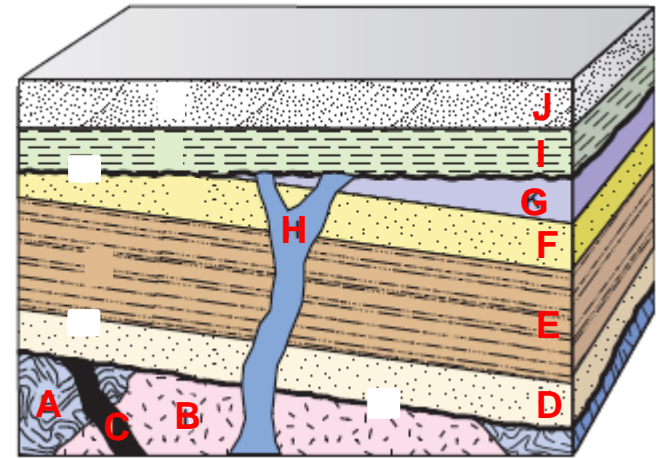
`synonym` [language: en]

intrusive igneous body

Example of annotation

Application in some instances

- ◆ 0A_object_A
- ◆ 0A_rock_A
- ◆ 0B_object_B
- ◆ 0B_rock_B
- ◆ 0C_object_C
- ◆ 0C_rock_C
- ◆ 0D_object_D
- ◆ 0D_rock_D
- ◆ 0E_object_E
- ◆ 0E_rock_E
- ◆ 0F_object_F
- ◆ 0F_rock_F
- ◆ 0G_object_G
- ◆ 0G_rock_G
- ◆ 0H_object_H
- ◆ 0H_rock_H
- ◆ 0I_object_I
- ◆ 0I_rock_I
- ◆ 0J_object_J
- ◆ 0J_rock_J
- ◆ 1_contact_A_B



Description: 0E_object_E

Types +

- **Stratum** ? @ x o
- 'Host Object' ? @
- 'Overlying Stratum' ? @
- 'Underlying Object' ? @

Same Individual As +

Different Individuals +

Property assertions: 0E_object_E

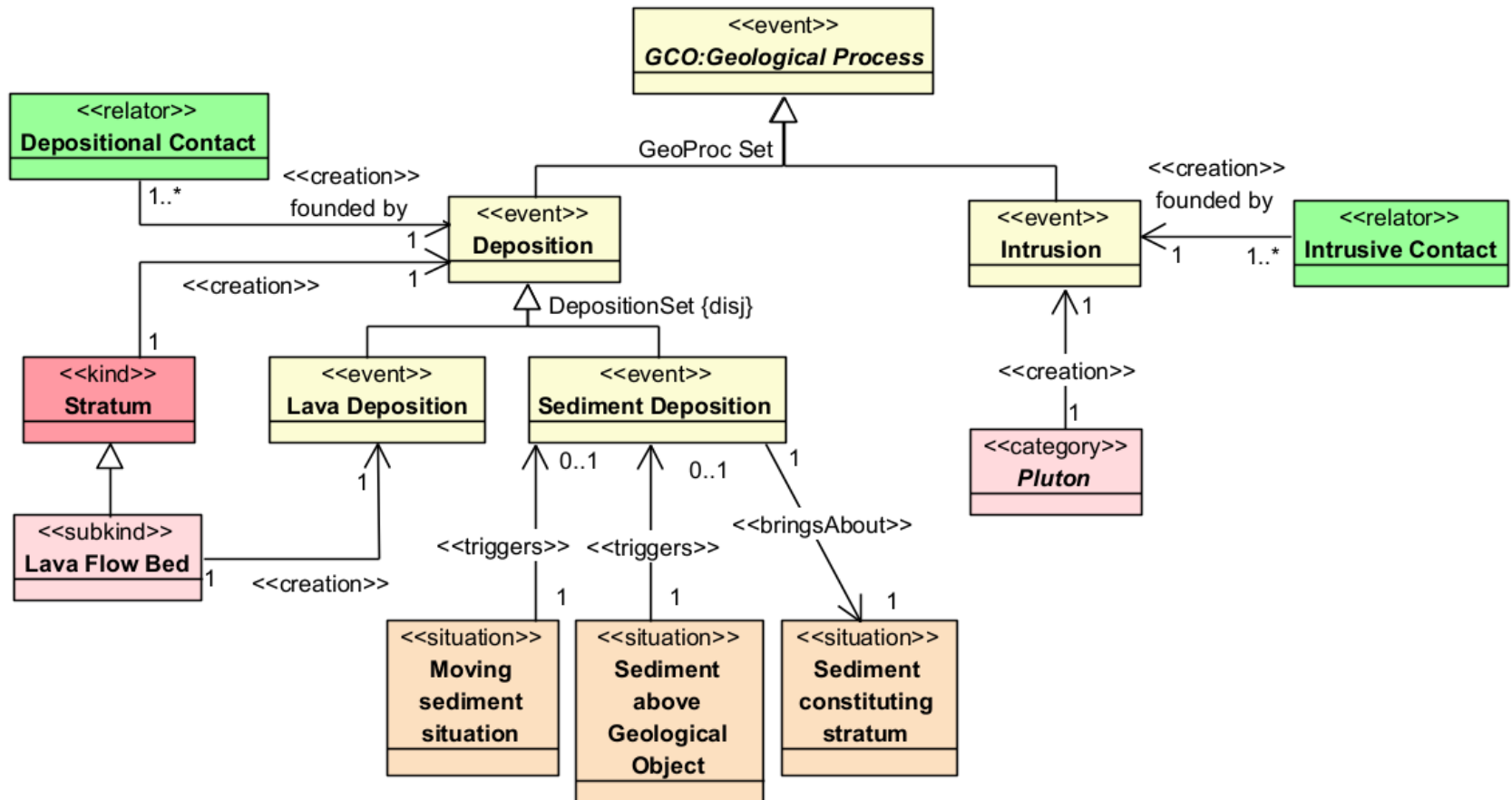
Object property assertions +

- **overlies** 0D_object_D ? @ x o
- 'constituted by' 0E_rock_E ? @
- **olderThan** 0G_object_G ? @
- **olderThan** 0J_object_J ? @
- **olderThan** 0F_object_F ? @
- **olderThan** 0H_object_H ? @
- **olderThan** 0I_object_I ? @
- **youngerThan** 0B_object_B ? @
- **youngerThan** 0A_object_A ? @
- **youngerThan** 0C_object_C ? @
- **youngerThan** 0D_object_D ? @

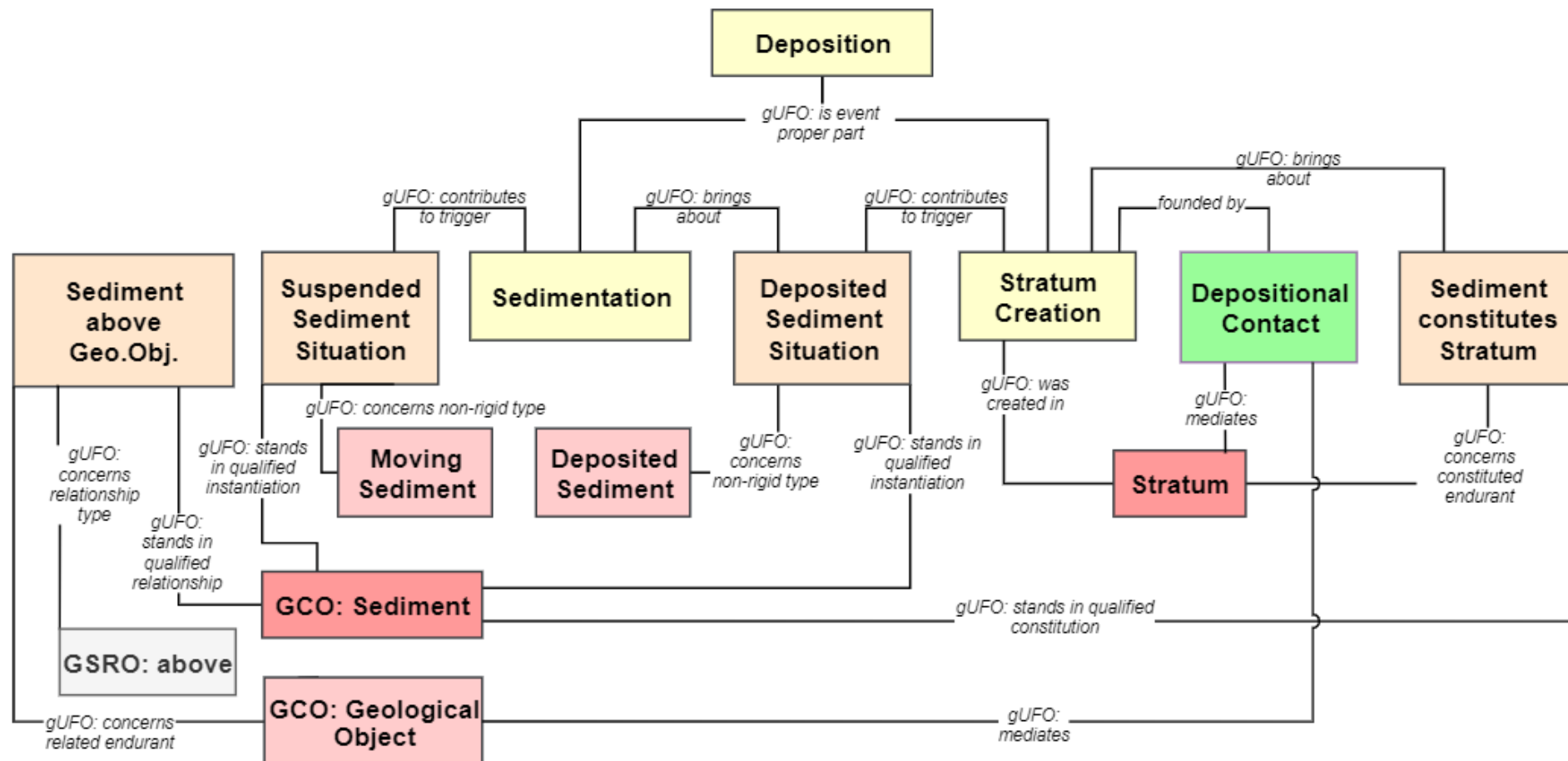


Events

Events, Situations, and things that are created



Detailing Deposition in gUFO



Detailing Intrusion in gUFO

