

Submarine fan - reservoir quality description (Marine depositional environment)

Submarine fan - reservoir quality description

Accumulation ⇔ GU X has good reservoir potential

No accumulation ⇔ GU X has poor to no reservoir potential

has_good_reservoir_potential(GU):-

has_facies (GU, FA),
facies_porosity (FA, Por), higher_eq (Por, medium),
facies_permeability (FA, Perm), higher_eq (Perm, medium),
facies_lateral_continuity (FA, LAC), better_eq (LAC, moderate),
facies_vertical_conectivity (FA, FVC), better_eq (FVC, moderate).

has_poor_to_no_reservoir_potential(GU):-

has_facies (GU, FA),
facies_porosity (FA, Por), lower_than (Por, medium),
facies_permeability (FA, Perm), lower_than (Perm, medium),
facies_lateral_continuity (FA, LAC), poorer_than(LAC, moderate),
facies_vertical_conectivity (FA, FVC), poorer_than (FVC, moderate).

Submarine fan - reservoir quality description

Effective migration through a carrier bed (GU X) \Leftrightarrow GU X has good carrier bed potential

Less effective to no migration through a carrier bed (GU X) \Leftrightarrow GU X has poor to no carrier bed potential

has_good_carrier_bed_potential (GU):-

has_facies(GU, FA), facies_permeability(FA, Perm), higher_than(Perm, medium),
facies_porosity (FA, Por), better_eq(Por, moderate),
facies_lateral_continuity(Fa, LAC), better_than(LAC, moderate),
faces_vertical_conectivity(FA, FVC), better_than(FVC, mderate).

has_poor_to_no_carrier_bed_potential (GU):-

has_facies(GU, FA), facies_permeability(FA, Perm), lower_than(Perm, medium),
facies_porosity (FA, Por), lower_than(Por, moderate),
facies_lateral_continuity(Fa, LAC), poorer_than(LAC, moderate),
faces_vertical_conectivity(FA, FVC), poorer_than(FVC, mderate).

Submarine fan - reservoir quality description

has_facies(GU, a).

has_facies(GU, b).

has_facies(GU, c).

has_facies(GU, d).

has_facies(GU, e).

has_facies(GU, g).

belongs_to_res_element(a, feeder_channel).

belongs_to_res_element(b, distributary_channel).

belongs_to_res_element(c, lobe).

belongs_to_res_element(d, lobe_fringe).

belongs_to_res_element(e, levee).

belongs_to_res_element(g, basin_plain).

facies_porosity(a, medium).

facies_porosity(b, high).

facies_porosity(c, very_high).

facies_porosity(d, low).

facies_porosity(e, medium).

facies_porosity(g, very_low).

facies_permeability(a, very_high).

facies_permeability(b, high).

facies_permeability(c, high).

facies_permeability(d, low).

facies_permeability(e, medium).

facies_permeability(g, very_low).

facies_lateral_continuity(a, poor).

facies_lateral_continuity(b, moderate).

facies_lateral_continuity(c, good).

facies_lateral_continuity(d, good).

facies_lateral_continuity(e, poor).

facies_lateral_continuity(g, good).

facies_vertical_conectivity(a, poor).

facies_vertical_conectivity(b, moderate).

facies_vertical_conectivity(c, good).

facies_vertical_conectivity(d, poor).

facies_vertical_conectivity(e, poor).

facies_vertical_conectivity(g, good).

better_than(very_good, good).

better_than(good, moderate).

better_than(moderate, poor).

better_than(poor, very_poor).

higher_than(very_high, high).

higher_than(high, medium).

higher_than(medium, low).

higher_than(low, very_low).

poorer_than(very_poor, poor).

poorer_than(poor, moderate).

poorer_than(moderate, good).

poorer_than(good, very_good).

lower_than(very_low, low).

lower_than(low, medium).

lower_than(medium, high).

lower_than(high, very_high).

Submarine fan - reservoir quality description

We can use only a limited number of scenarios, like the 3 examples below, or we can simulate all possible scenarios based on proximal_than relationship.

Scenario1

Belongs_to_res_element({Gu5, GU8, GU11, GU14}, lobe).

Scenario 2

belongs_to_res_element(GU5, lobe).

belongs_to_res_element(GU8, lobe).

belongs_to_res_element(GU11, distributary_channel).

belongs_to_res_element(GU14, feeder_channel).

Scenario 3

belongs_to_res_element(GU5, lobe_fringe).

belongs_to_res_element(GU8, lobe).

belongs_to_res_element(GU11, distributary_channel).

belongs_to_res_element(GU14, feeder_channel).

proximal_than(feeder_channel, distributary_channel).

proximal_than(distributary_channel, lobe).

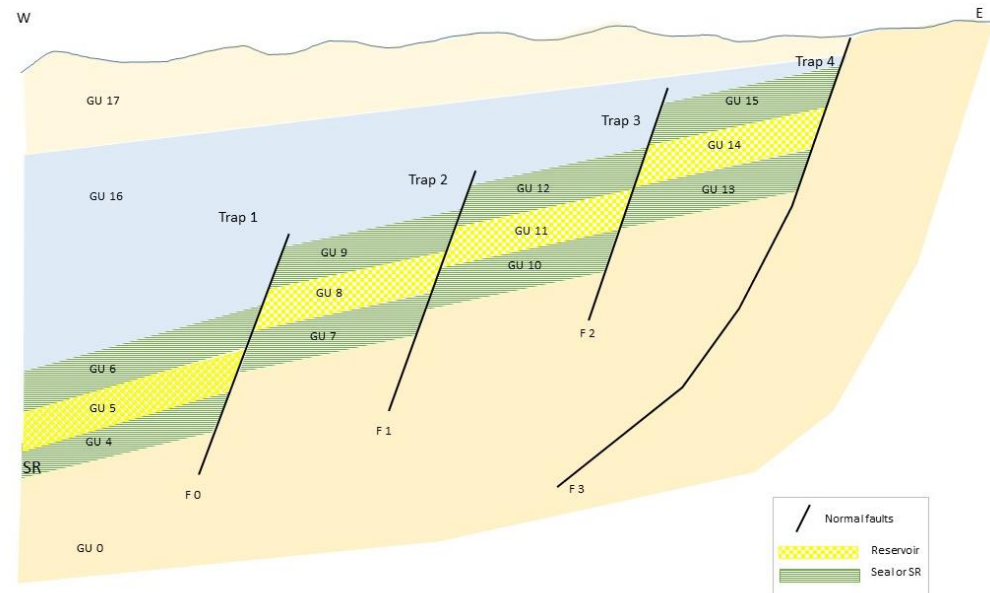
proximal_than(lobe, lobe_fringe).

proximal_than(lobe_fringe, basin_plain).

proximal_than(GU5, GU8).

proximal_than(GU8, GU11).

proximal_than(GU11, GU14).



Summary

- GU X has good reservoir potential if GU X belongs to reservoir elements: lobe, distributary channel, levee, feeder channel.
- GU X has poor to no reservoir potential if GU X belongs to reservoir elements: lobe fringe, basin plain.
- GU X has good carrier bed potential if GU X belongs to reservoir elements: lobe, distributary channel.
- GU X has poor to no carrier bed potential if GU X belongs to reservoir elements: lobe fringe, feeder channel, basin plain.