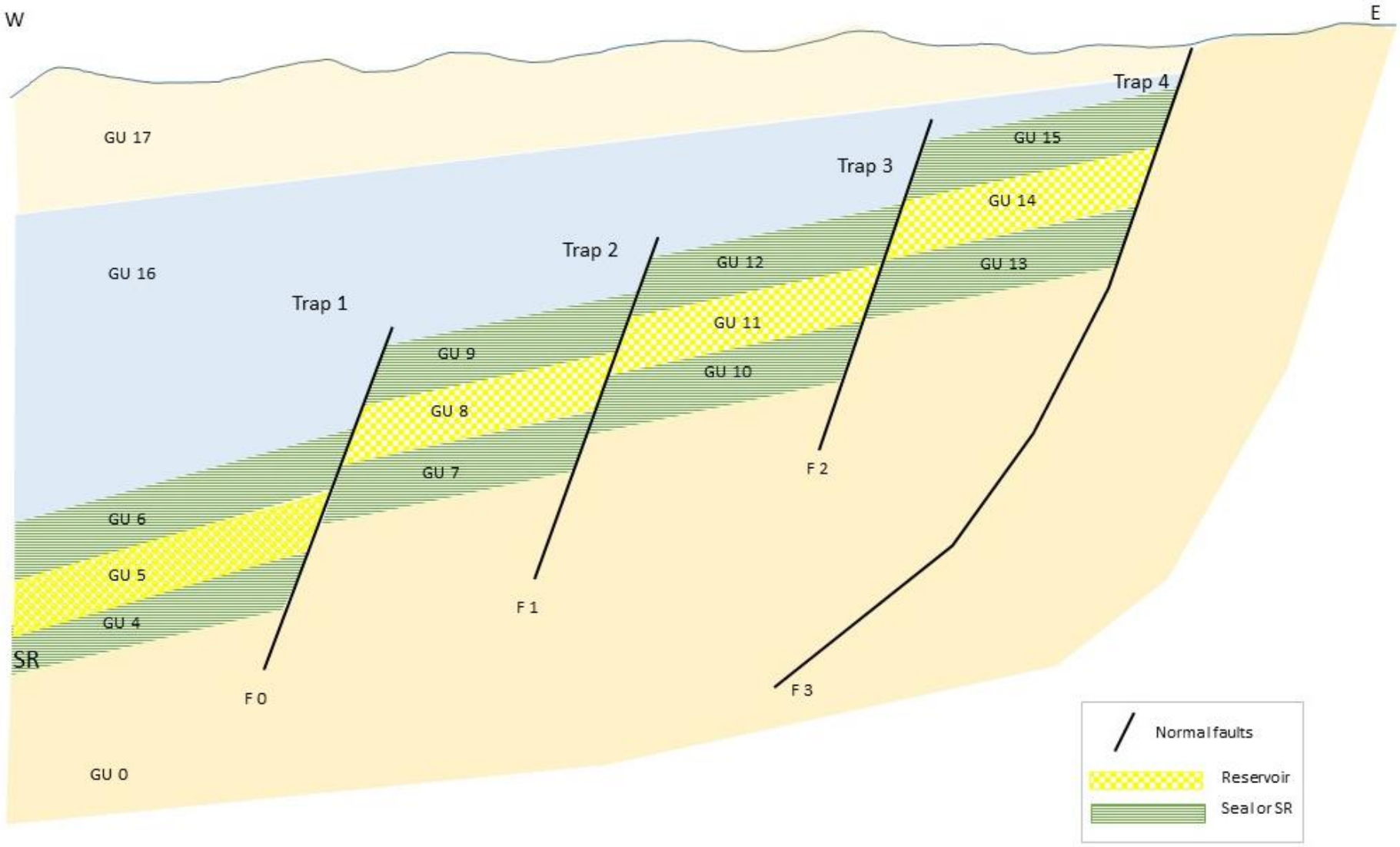
Petroleum system processes / events

Relative timing

Case study data



Petroleum system processes

- **Migration** of hydrocarbons through migration pathways
  - > Pathways must be formed before the migration starts <-> Tmigration < Tpathways
- **Accumulation** of hydrocarbons inside the trap
  - > Trap must be formed before the migration for hydrocarbons to accumulate <-> Tmigration < T trap_formation
- **Trap formation**

$\Rightarrow$ to have accumulation inside a trap the migration pathways and trap must have been formed before the start of migration

T1<T2 <=> T1 is younger than T2 (T1 happened after T2)

T1>T2 <=> T1 is older than T2 (T1 happened before T2)

The simplest way ☺

- Migration happened before the pathways and trap formation-> No accumulation
  - Tmigration > Ttrap_formation -> No Accumulation
  - Tmigration > Tpathways_formation -> No Accumulation
- Migraton happened after the pathways and trap formation -> Accumulation
  - Tmigration < Ttrap_formation -> Accumulation
  - Tmigration < Tpathways_formation -> Accumulation

  - TF0 = Ttrap1 = T1
  - TF1 = Ttrap2 = T1
  - TF2 = Ttrap3 = T1
  - TF3 = Ttrap4 = T2
  - TF0 = TF1 = TF2 = T1
  - T1 > T2

  - Tmigration = T3

  - Tpathway 1 = T4
  - Tpathway2 = T1
  - Tpathway3 = T1
  - Tpathway4 = T1

T3 < T1 AND T2 ⇔ Accumulation inside the trap1, trap2, trap 3 and trap4

T3 > T1 BUT T3 >T2 ⇔ Accumulation inside trap1, trap2 and trap 3 but No Accumulation inside trap 4

T3 > T1 AND T2 ⇔ No accumulation inside trap1, trap2 , trap3 or trap 4

The more geological way ☺

- Assign a time (an age) to each geological unit (GU) or just define what is the time relationship between them (older / younger).
- Define the cross-cutting relationship ⇔ Fault F is younger than the GUs that F is cutting and older than the GUs that are above the fault F and not cut by the fault F.
- Timing of the trap formation is the time when the faults stopped moving (stopped being active) ⇔ we can say in this case that Tfault = T trap_formation .

The more geological way ☺

- TGU0 > TGU4 > TGU5 >.....>TGU15 > TGU16 > TGU17 (GU0 is older than GU1…GU17)
- Timing of the trap is equivalent with the time when the fault stop being active
  - The age of the fault is equivalent with the age of the youngest GU that the fault is cutting -> infer the timing of the faults (traps formation) using the cross-cutting relationship
    - TF0 < TGU3 (F0 is younger than GU3)
    - TF0 >= TGU16
    - TF1 < TGU3
    - TF1 >= TGU16
    - TF2 < TGU3
    - TF2 >= TGU16
    - TF3 < TGU3
    - TF3 < TGu16
    - TF3 >= TGU17

->F0, F1 and F2 have the same age, F2 is younger than F0, F1 and F2

TF0 = TF1 = TF2 = T1

Ttrap1 = Ttrap2 = Ttrap3 = T1

TF3 = T2

Ttrap4 = T2

Tmigration = T3

The more geological way ☺

Tpathway1 = TGU5 = T4
Tpathway2 = TF0 = T1
Tpathway3 = TF1 = T1
Tpathway4 = TF3 = T1

T3 < T4 ⇔ migration into Gu5
T3 < T1 AND T2 ⇔ Accumulation inside the trap1, trap2, trap 3 and trap4
T3 > T1 BUT T3 >T2 ⇔ Accumulation inside trap1, trap2 and trap 3 but No Accumulation inside trap 4
T3 > T1 AND T2 ⇔ No accumulation inside trap1, trap2 , trap3 or trap 4