The Enigma of the Albian Gap: lateral variability and competition between expulsion and extension

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Acknowledgements:
Competing Hypothesis

Jackson et al. (2015)

Salt-detached gravity-driven deformation:

Extension-driven (post-Albian)

Expulsion-driven (post-Albian)

Albian Gap competing hypotheses (based on restorations)

Rowan and Ratliff (2012)
Variable Rollover Geometries

**EXTENSION**

- **a)** extensional growth wedges

**EXPULSION**

- **b)** progradational sigmoidal wedges

Physical models -
Jackson and Hudec (2017) by T. Dooley

Seismic examples -
Jackson and Hudec (2017)

Physical models -
Ge et al (1997)

Seismic examples -
Jackson and Hudec (2017)
Small (2-6 km of heave) landward-dipping listric faults, not a single trough-going fault (e.g. Cabo Frio Fault)
Rollers (R) and faults young basinward due to margin-scale progradation over inflated salt

Salt detachment dips gently (~1deg) landward and present small base-salt steps

Sigmoidal (basinward-thinning) \textbf{(WHITE)} vs. basinward-thickening \textbf{(RED)} wedges: \textit{extension} vs \textit{expulsion}
Diapir geometry itself cannot be purely explained by reactive diapirism (i.e. extension): near-diapir stratal upturn
Lateral variability (centre)

Sigmoidal wedges downlap Albian interval updip

Halokinetic Seq. and stratal upturn

Sigmoidal wedges downlap stranded Albian block

Bounding diapir is \textit{not} extensional (post-Albian)
Restorations

Constraints

Extensional wedges vs Sigmoidal wedges

Downdip translation (RSB, Pichel et al. 2018)

Flexural isostasy

Unfolding to a gently-dipping top (slope seabed)

26 (±2) km of post-Albian extension

24 (±2) km already present during Albian as a diapir

Base-salt reversal (landward-dip) due to loading and isostasy
Salt-detached Counter-regional faults?

What controls the development of large gravity-driven counter-regional (i.e. landward-dipping) faults in Santos (and possibly other basins)?

1) Post-Albian progressive reversal of base-salt to a landward-dip (c-d)

2) Presence of landward-dipping base-salt steps

3) Post-Albian extension is driven by rapid margin-scale progradation above thick/inflated salt (b-c-d)
Albian Gap was formed by alternation of **extension** & **expulsion** with a broadly equal contribution (25-30 km) where the gap is wider (>50 km)

Evidence of **Extension:**
- a) Salt rollers and reactive diapirs
- b) Listric normal faults
- c) Basinward-thickening wedges

Evidence of **Expulsion:**
- a) Sigmoidal/clinoform-shaped wedges
- b) Halokinetic sequences and upturned flaps
- c) Inflated bounding diapirs

Where the Albian Gap is narrower (<30 km) extension dominates

Large counter-regional fault and basinward-dipping rollover formed primarily by margin-scale progradation above thick/inflated salt

Balances the amount of overburden translation further downdip (mega-footwall): 28-32 (+2) km in post-Albian RSBs (Pichel et al., 2018)