GAWPS - A MRST-Based Module for Wellbore Profiling and Graphical Analysis of Flow Units

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Thiago RODRIGUES and Gustavo OLIVEIRA

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Petroleum Engineering Modeling Laboratory - `lamep.ci.ufpb.br`
Scientific Computing Department
Federal University of Paraíba - Brazil
`gustavo.oliveira@ci.ufpb.br` (corr. auth.)
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Motivation, purpose, and background

Why

"Rock typing and flow unit identification (...) have been challenging due to the complexity of pore networks (...) facies changes, and diagenetic processes. " (Riazi, 2018)

What

- Lack of open-source tools;
- Petrophysical data integration;
- Education and formation;

For

Provide routines that carry out graphical analysis for wellbore profiling by using classical methods and automated flow unit classification.

Background

A hydraulic flow unit is the REV of total reservoir rock whose geological and petrophysical properties are internally consistent (...)" (Amaefule, 1993)

HFUs are (Cannon, 2015):

i. facies, for geoleogists;
ii. corr. zones, for petrophysicists;
iii. reservoir layer, for engineers;
iv. *all that*, for modelers

Graphical methods involve:

- statistics;
- histograms and prob. plots;
- clustering;

Code overview

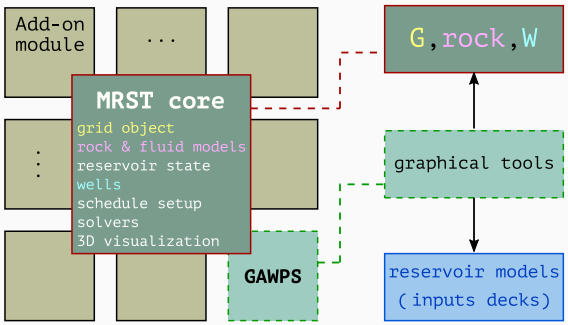

Figure 1: GAWPS communication with MRST core objects.

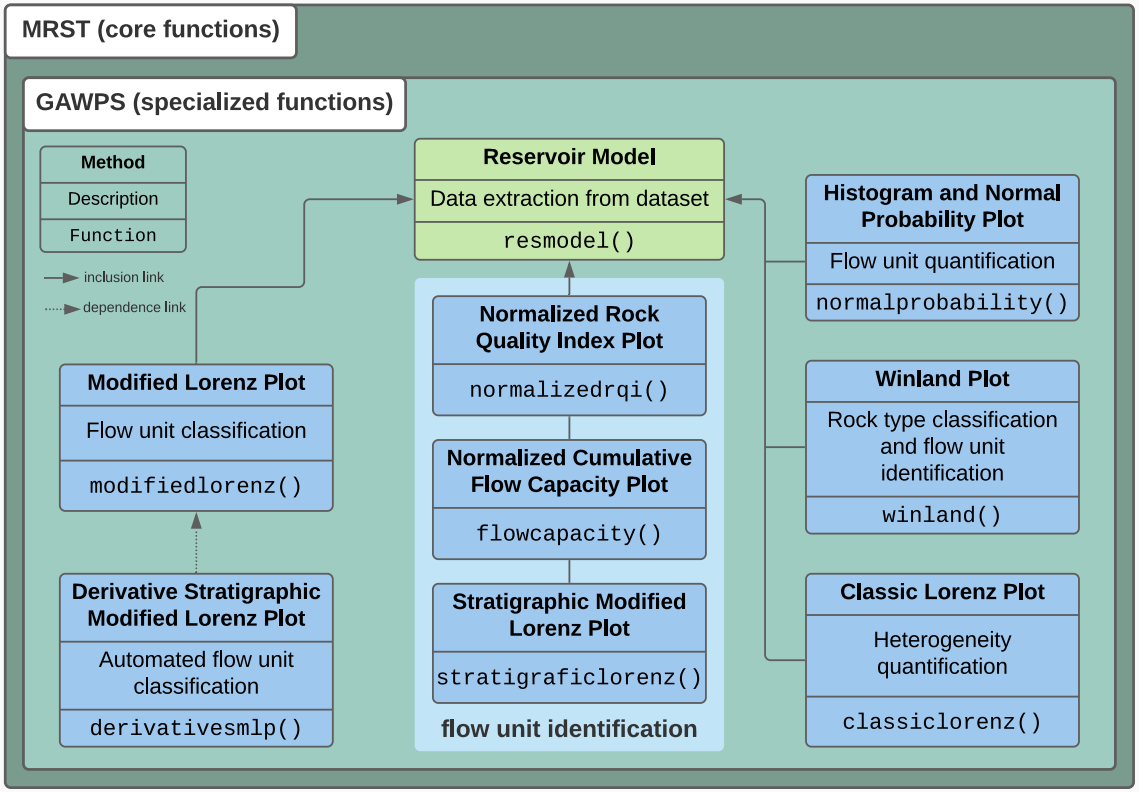

Figure 2: Computational routines currently available.

Demo script:

```
coord = [30,65; 48,100];

[G,gw,rock,indw] =

resmodel(coord,'SPE10');

[lp.F, lp.Lc] = classiclorenz(G,

rock.perm, indw);
```

Code repository (+examples):

https://github.com/gcpeixoto/gawps

Showcase

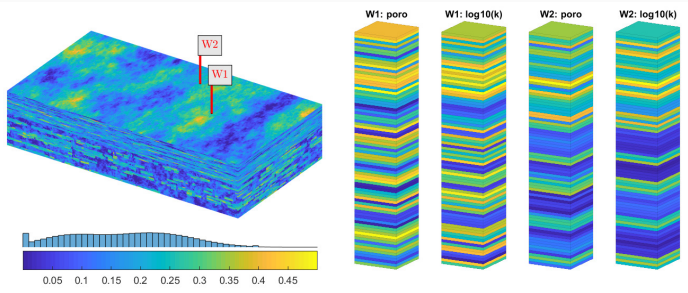

Figure 3: SPE10 (wells)

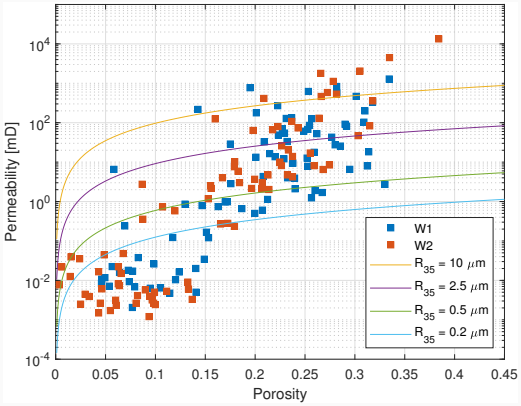

Figure 5: Winland plot

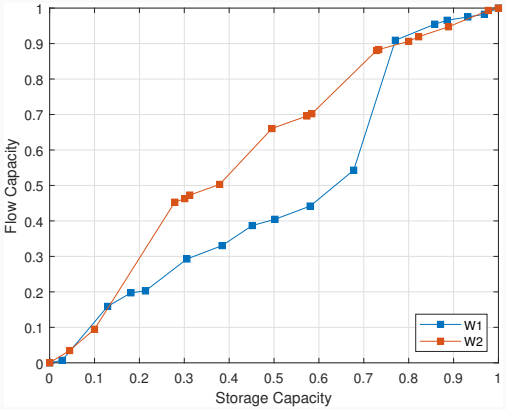

Figure 7: MLP

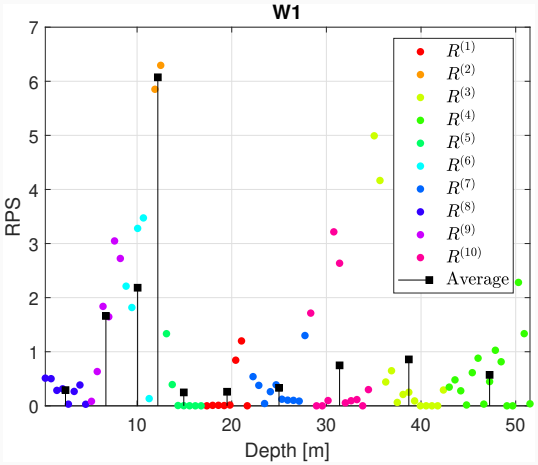

Figure 4: Cluster map

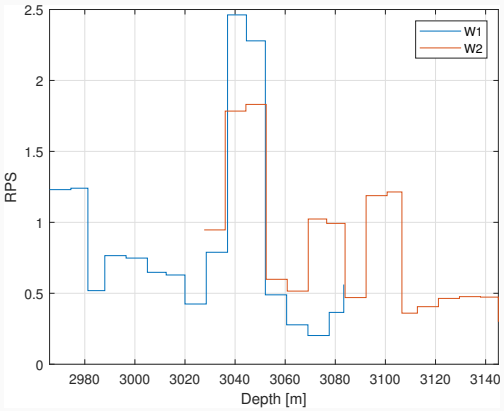

Figure 6: Derivative SMLP

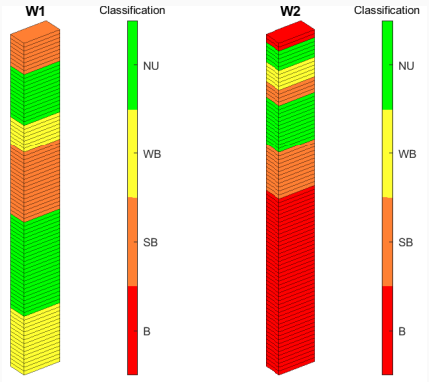

Figure 8: FU classif.

Showcase (cont.)

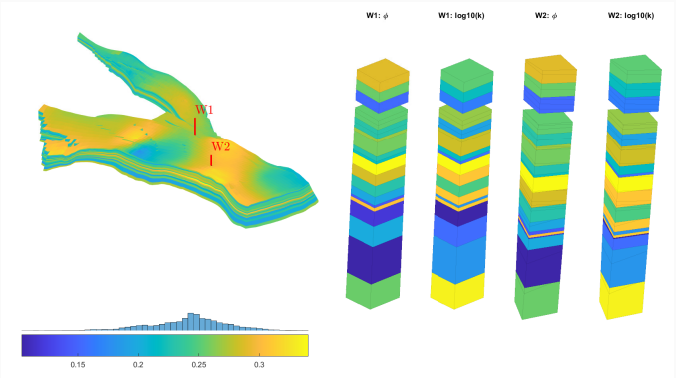

Figure 9: Norne (wells)

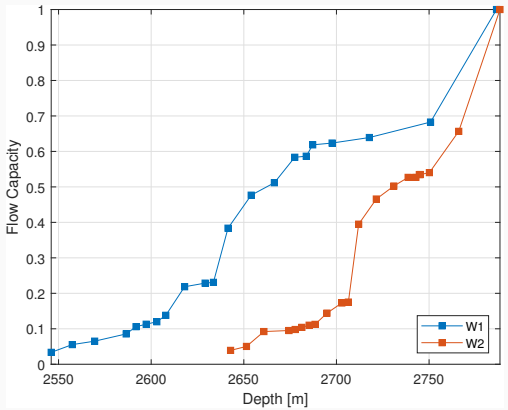

Figure 11: NCFC plot

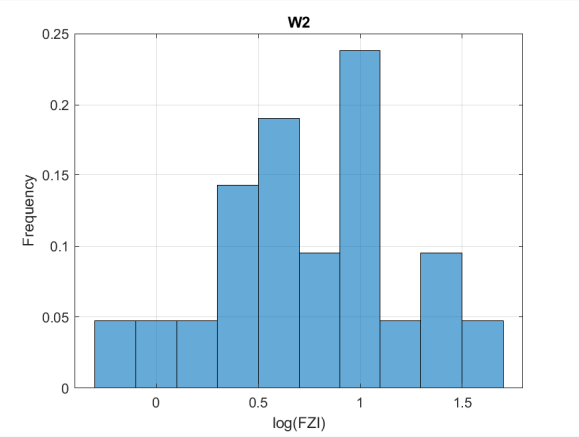

Figure 13: Histogram

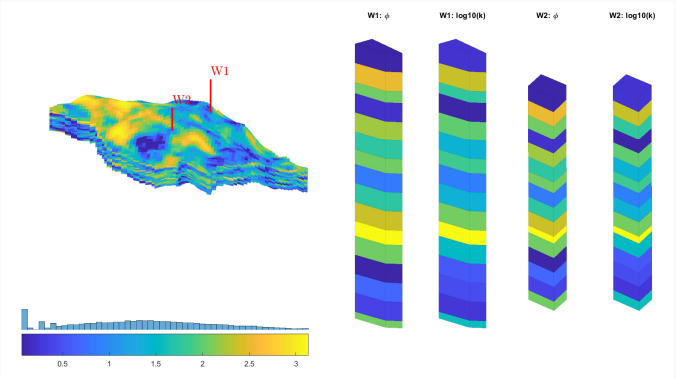

Figure 10: UNISIM-I-D (wells)

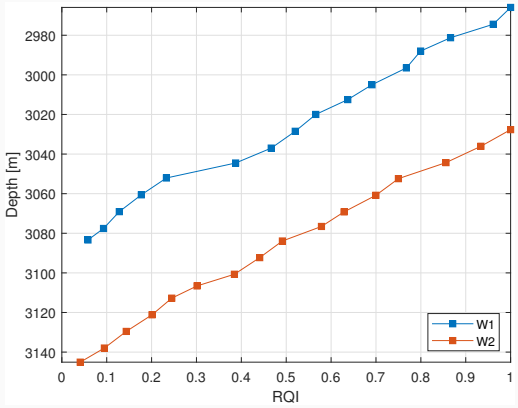

Figure 12: NRQI plot

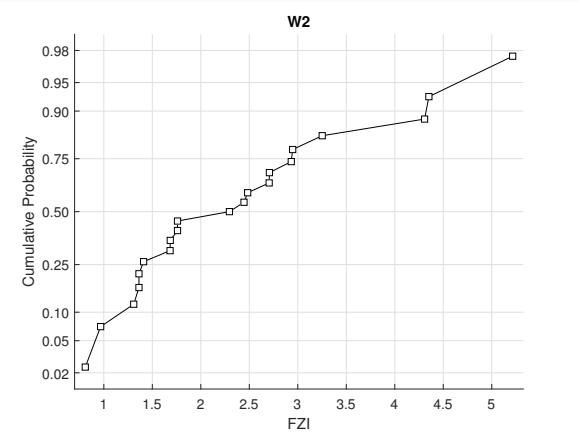

Figure 14: Prob. plot

Final comments

- What GAWPS still need of?
  - Feedback from experts and users
  - Tests on additional models
  - Improve RPS (baffles, barriers, FUs) clustering method
  - Expand capabilities to reach a robust release
- Acks go to:
  - Dr. K-A Lie (SINTEF)
  - Symposium organizers
  - Session audience

Cited references

- (Amaefule et al., 1993), DOI: 10.2118/26436-MS
- (Cannon, 2015), DOI: 10.1002/9781119313458
- (Riazi, 2018), DOI: 10.1016/j.petrol.2017.10.025

Further references

- DOI: 10.1016/j.petrol.2020.107730 | DOI: 10.1016/j.petrol.2019.106732
- DOI: 10.1016/j.petrol.2019.106680 | DOI: 10.1016/j.petrol.2017.06.016
- DOI: 10.1016/j.petrol.2016.06.008