Reservoir Engineering at two Geothermal field in El Salvador

Manuel Monterrosa

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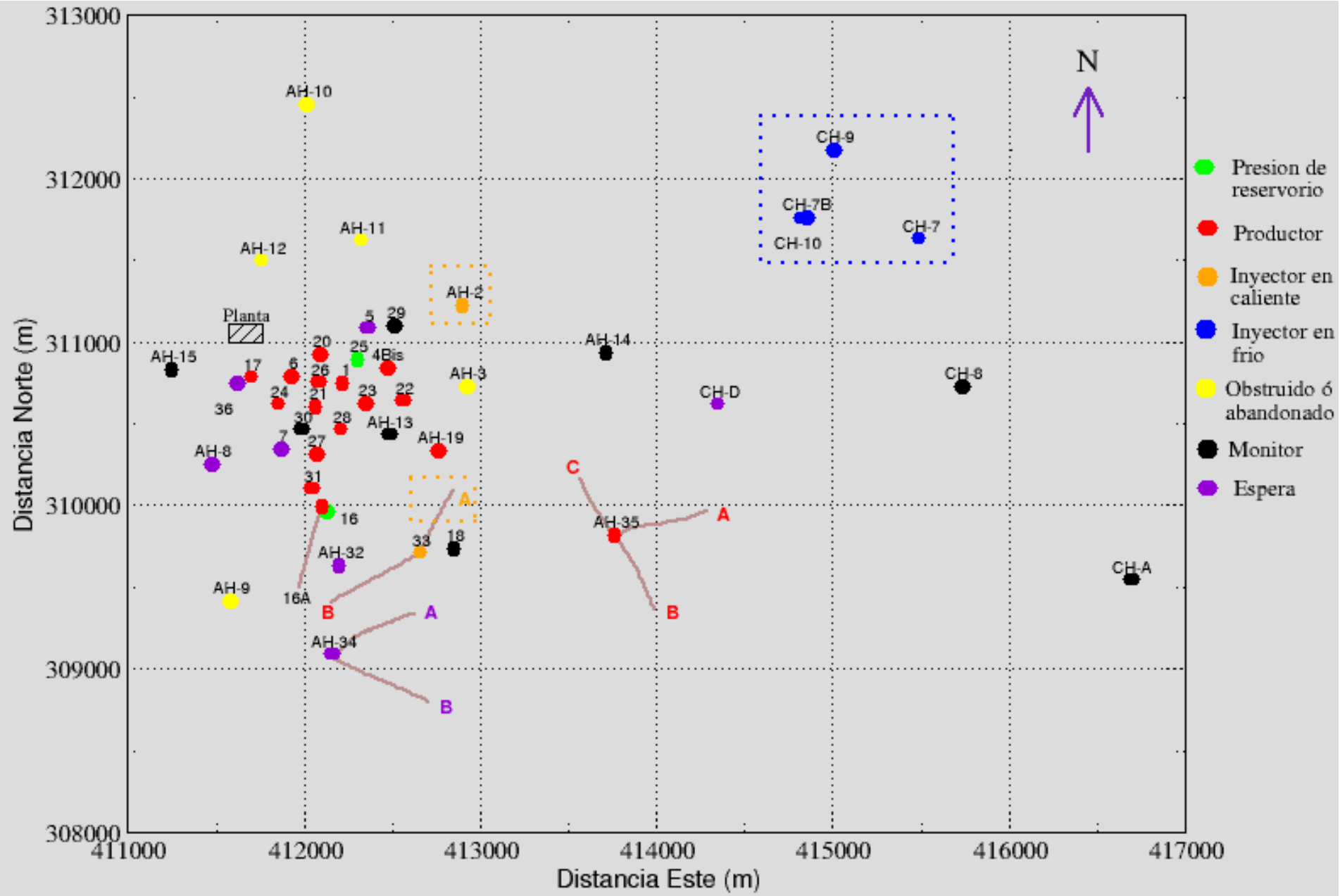
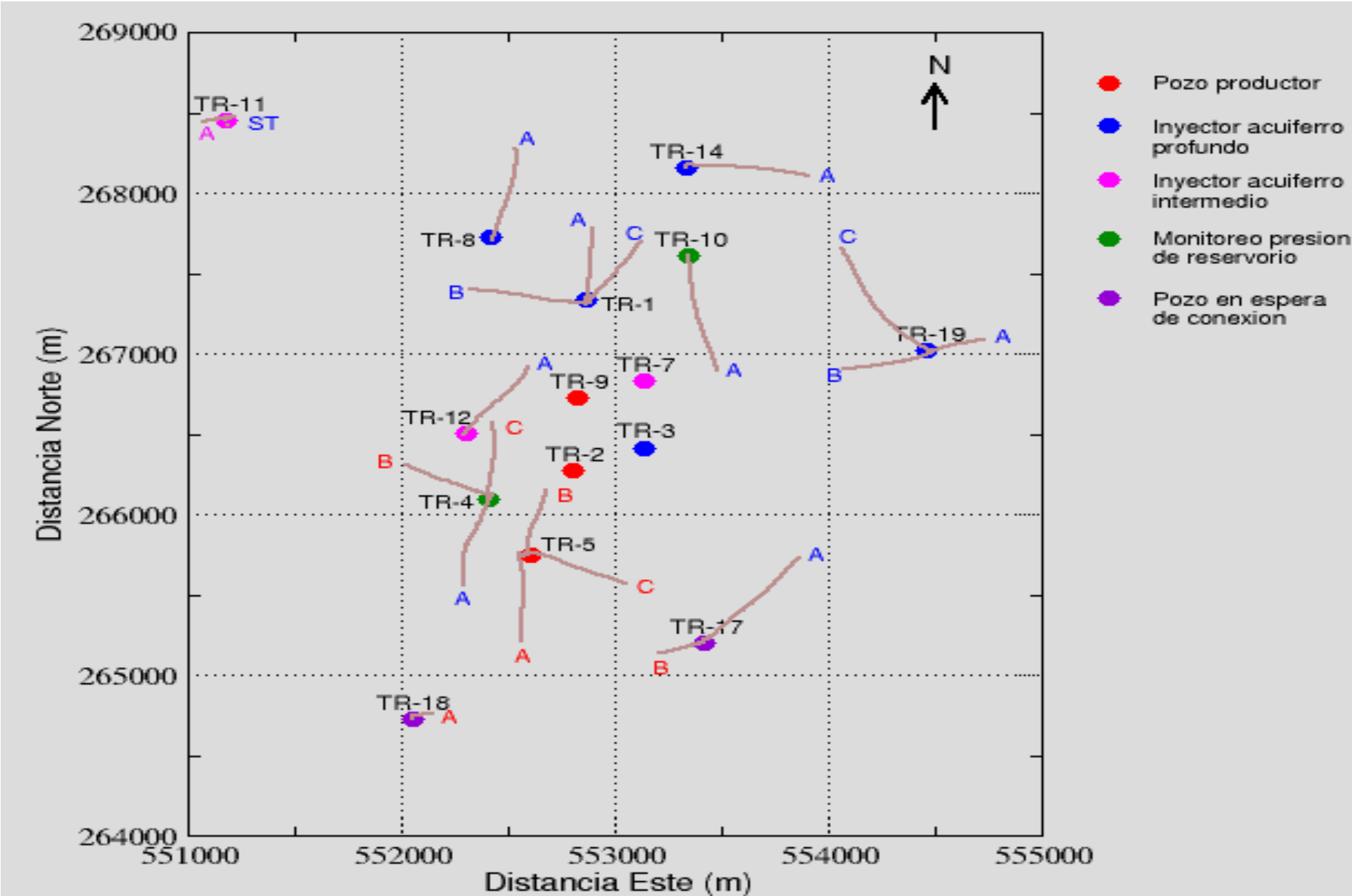
Reykjavik, ENGINE WP 4

Contents

Ahuachapán Geothermal Field

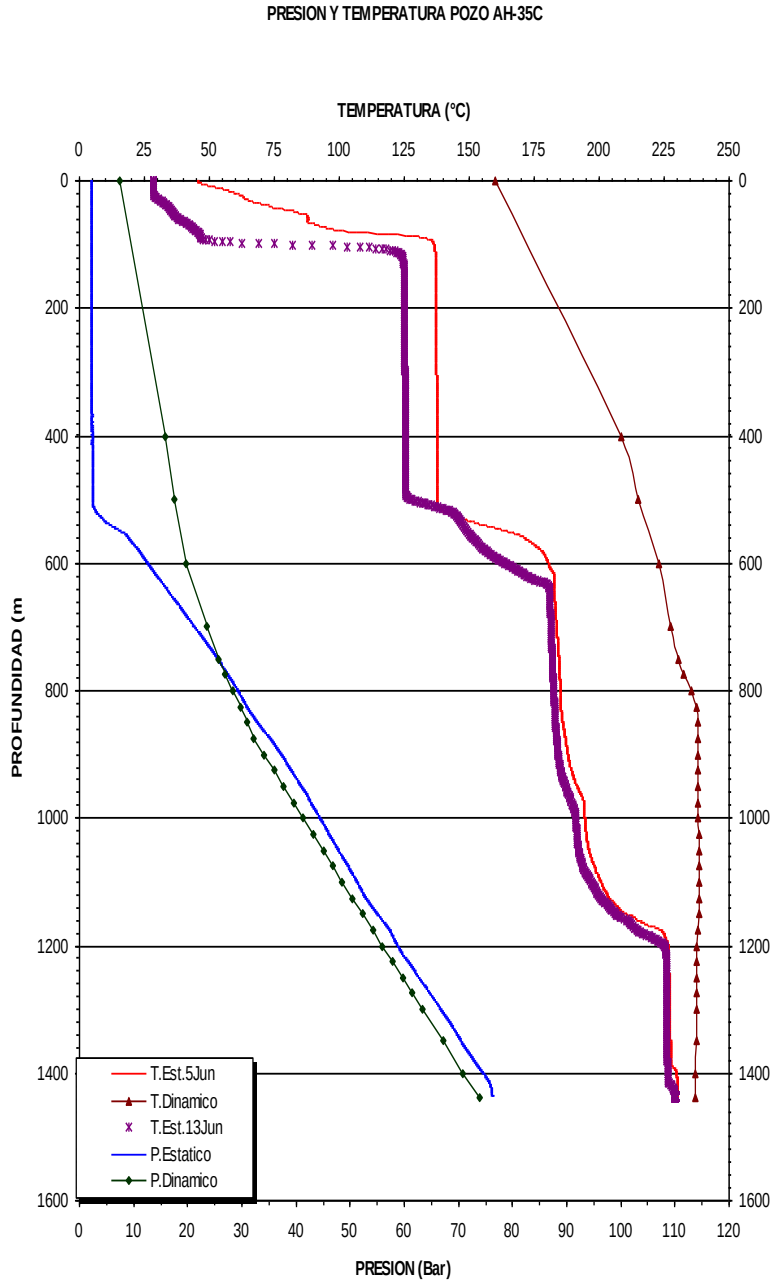


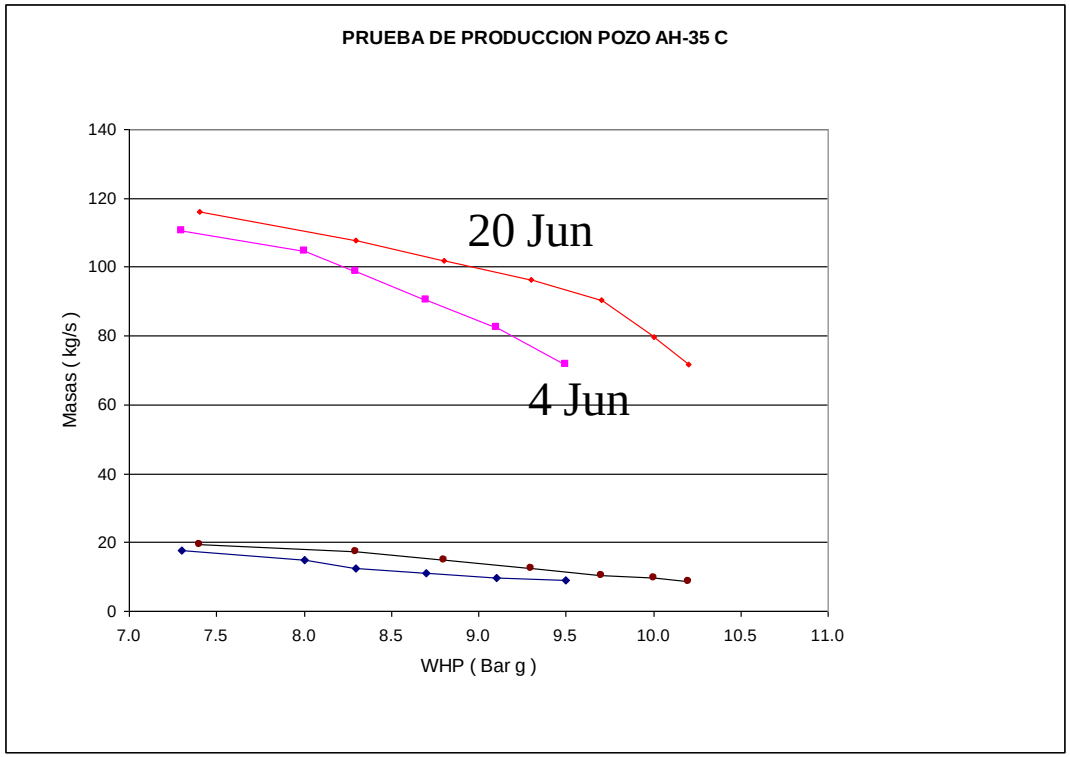
Berlin Geothermal Field



Monitoring

- Pressure and temperature profile in static or flowing conditions into the wells are used to know the permeable zones, flashing point, down flow, flow pattern into reservorio, pressure and temperature decline, etc
- Steam yield and injection flow rate are used to correlate with the electricity production (efficiency⇒Sustainability)
- Production characteristic (Q vrs WHP) indicate the operational condition to the power plant
- Chemistry of fluids (liquid, steam and gas) and steam/liquid flowrate are requiered to know which are the processes happening into the reservoir (dilution, boiling, injection return, thermal breakthrough, scaling or corrosion, mineral scaling inhibition,etc)

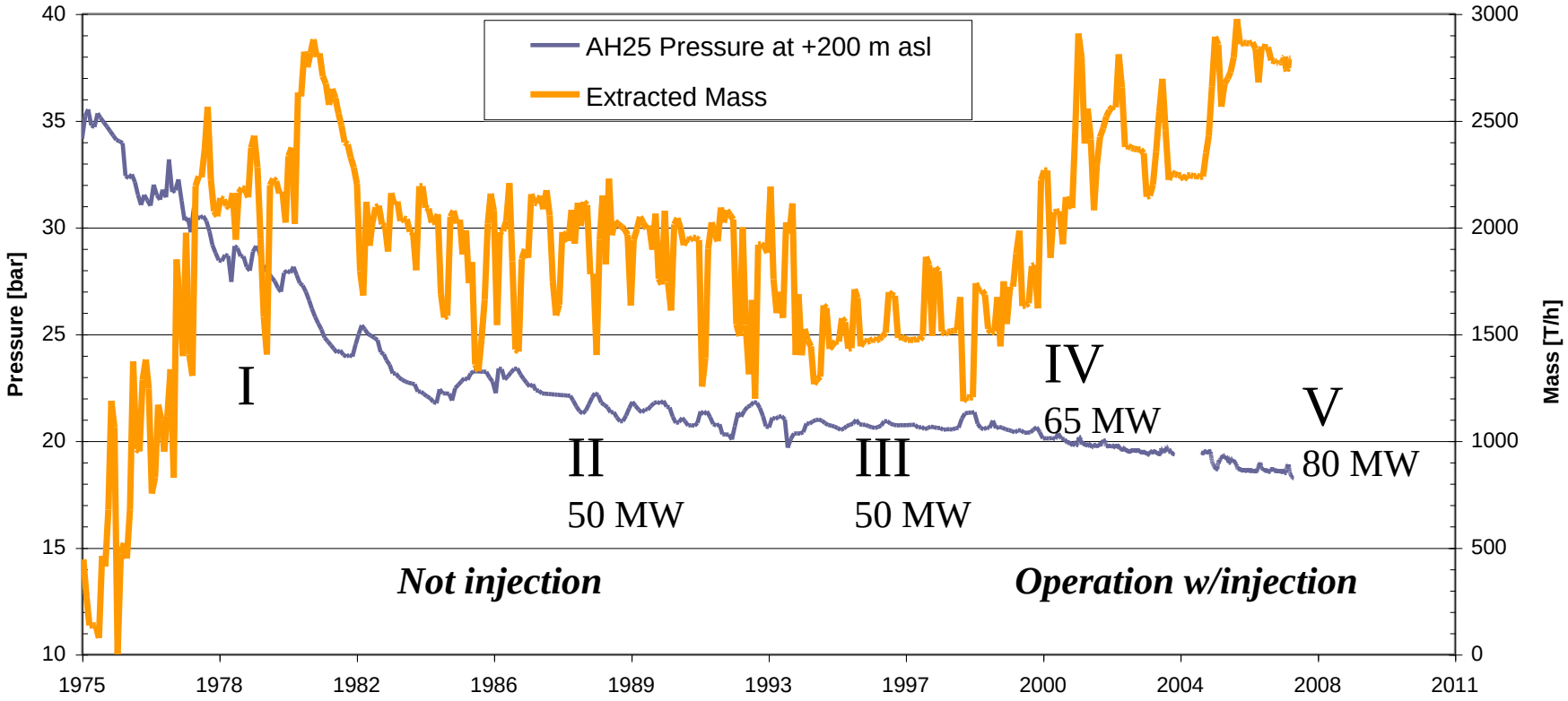




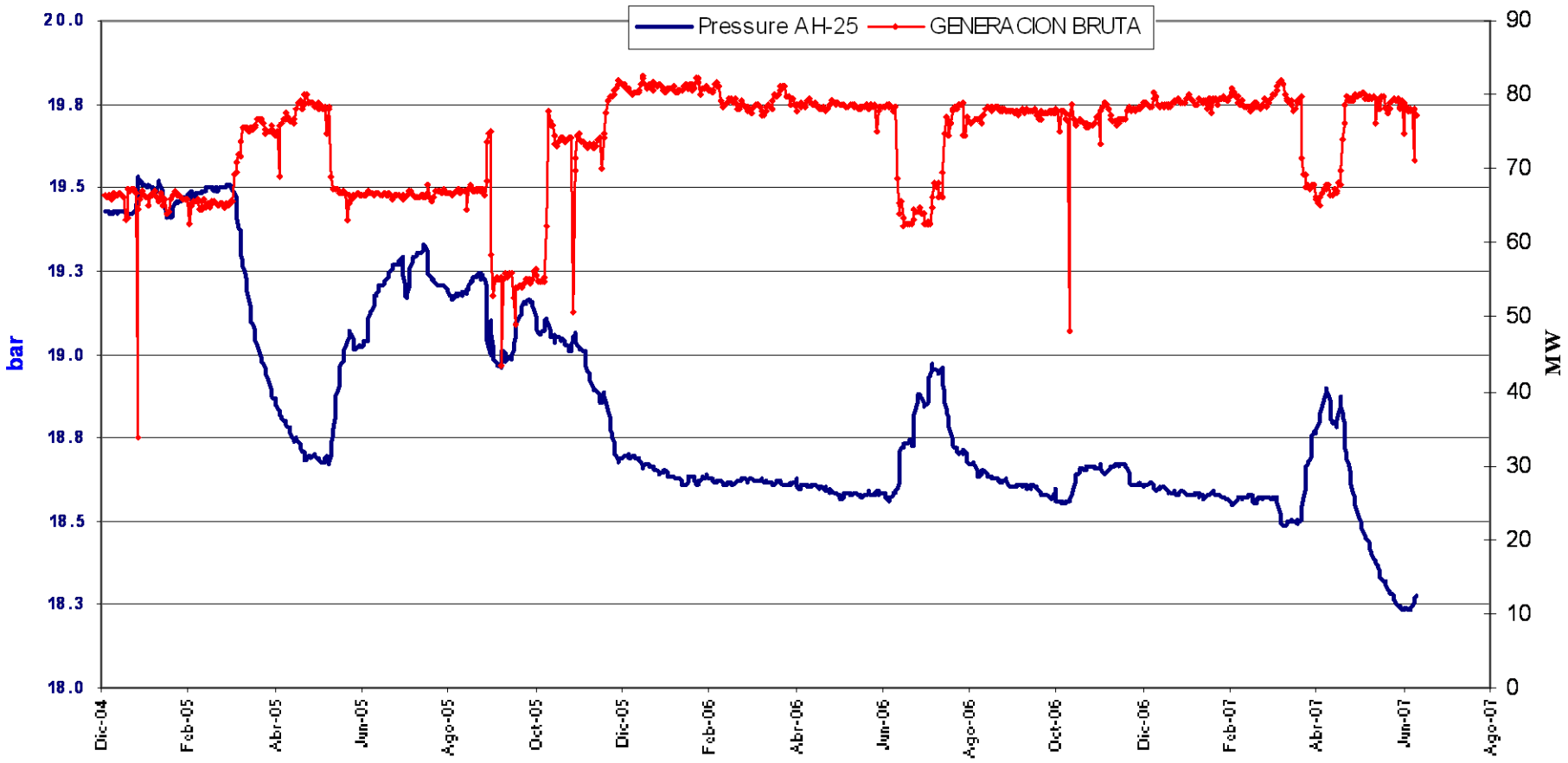
WHP:	***7.4 bar***
Steam:	***19.4 kg/s***
Liquid:	***96.8 kg/s***
Enthalpy	***1,070 kJ/kg.***

Discharge test well AH-35C
Junio 20th, 2007

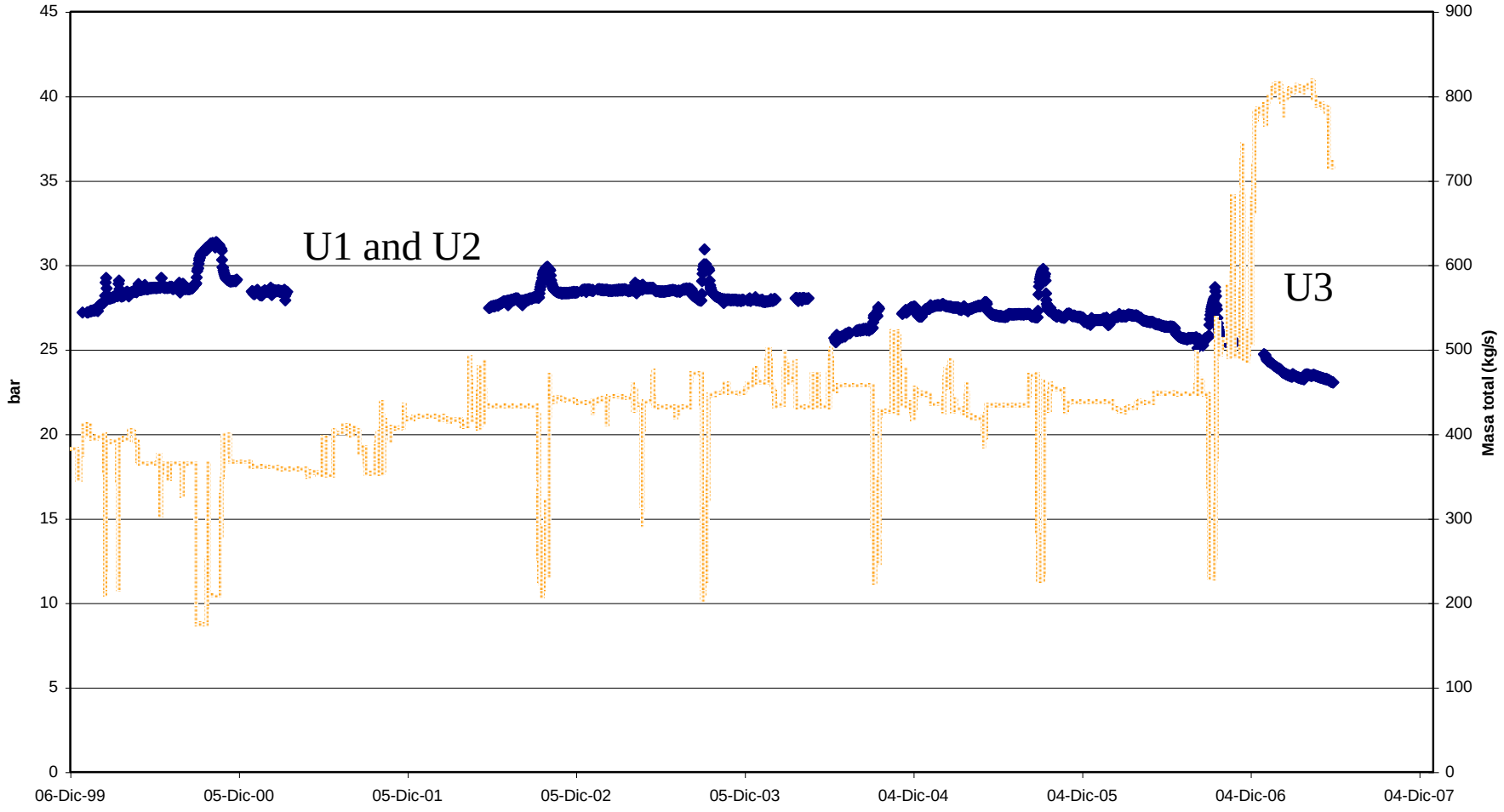
Mass and pressure historical trend, Ahuachapán Field



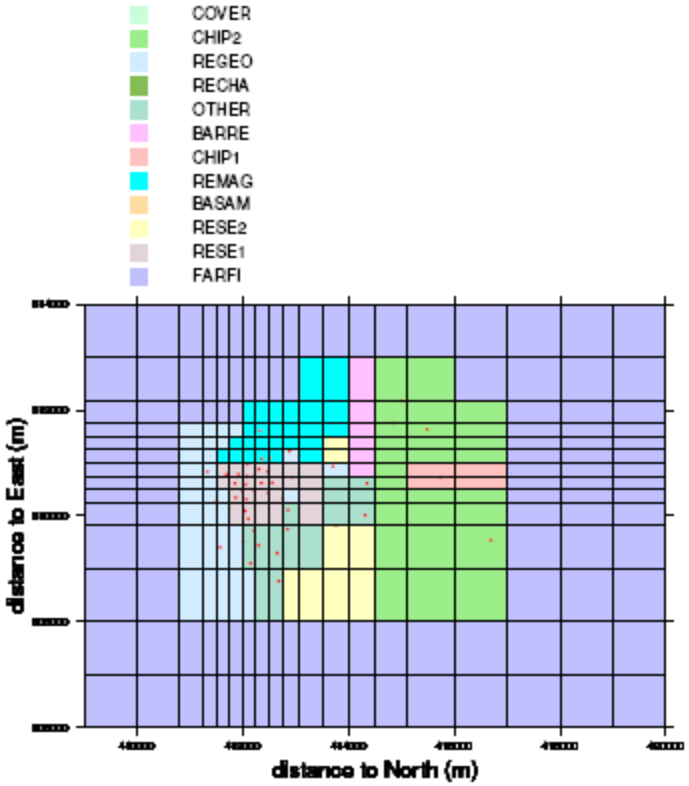
Power production and Pressure, Ahuachapan field

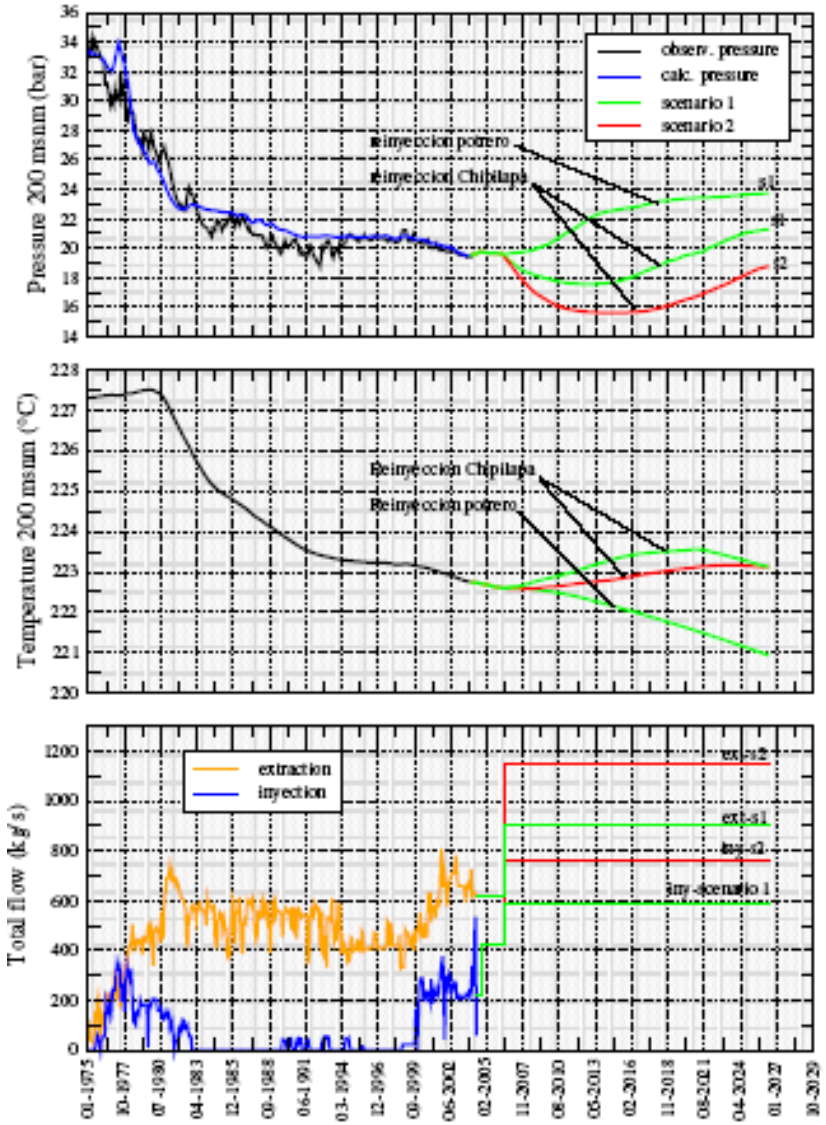


Mass and pressure trend at the Berlin Field

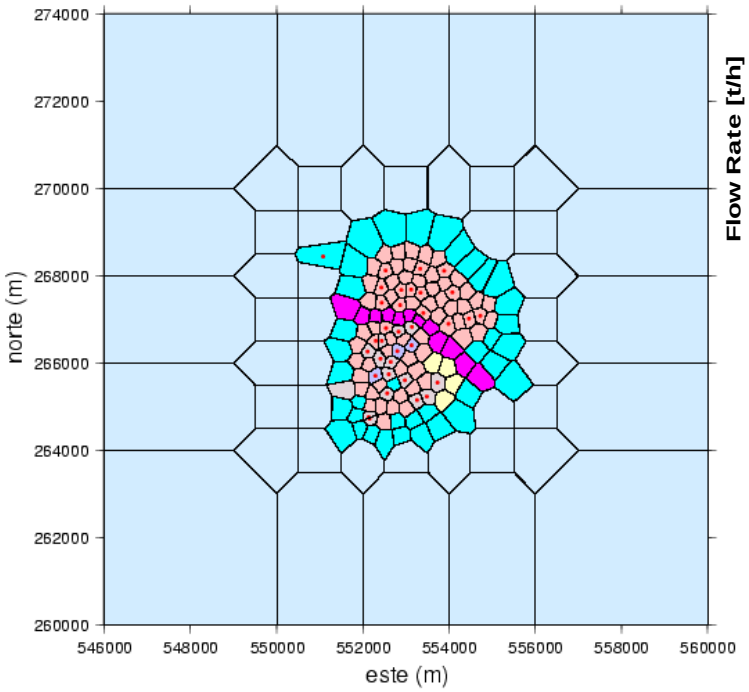


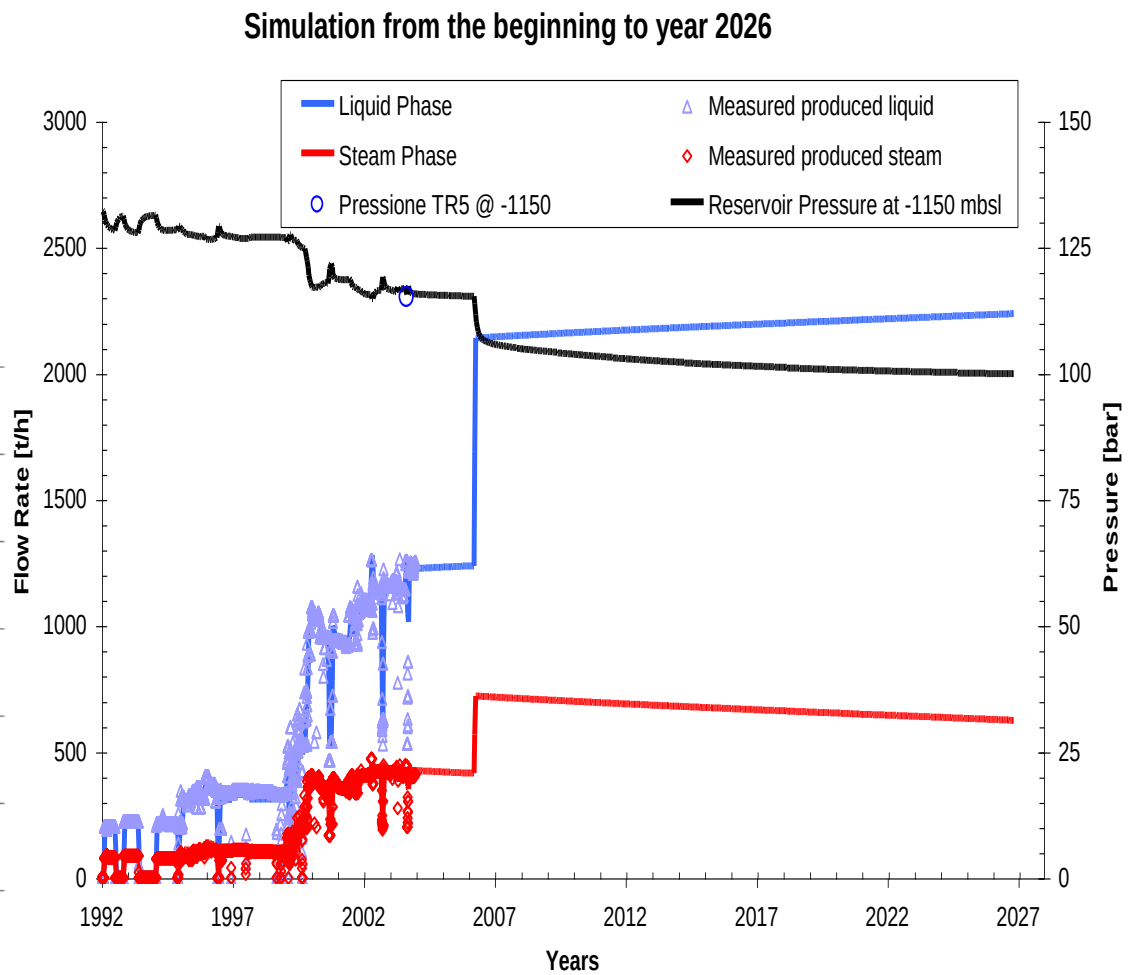
Numerical modeling for the Ahuachapán field





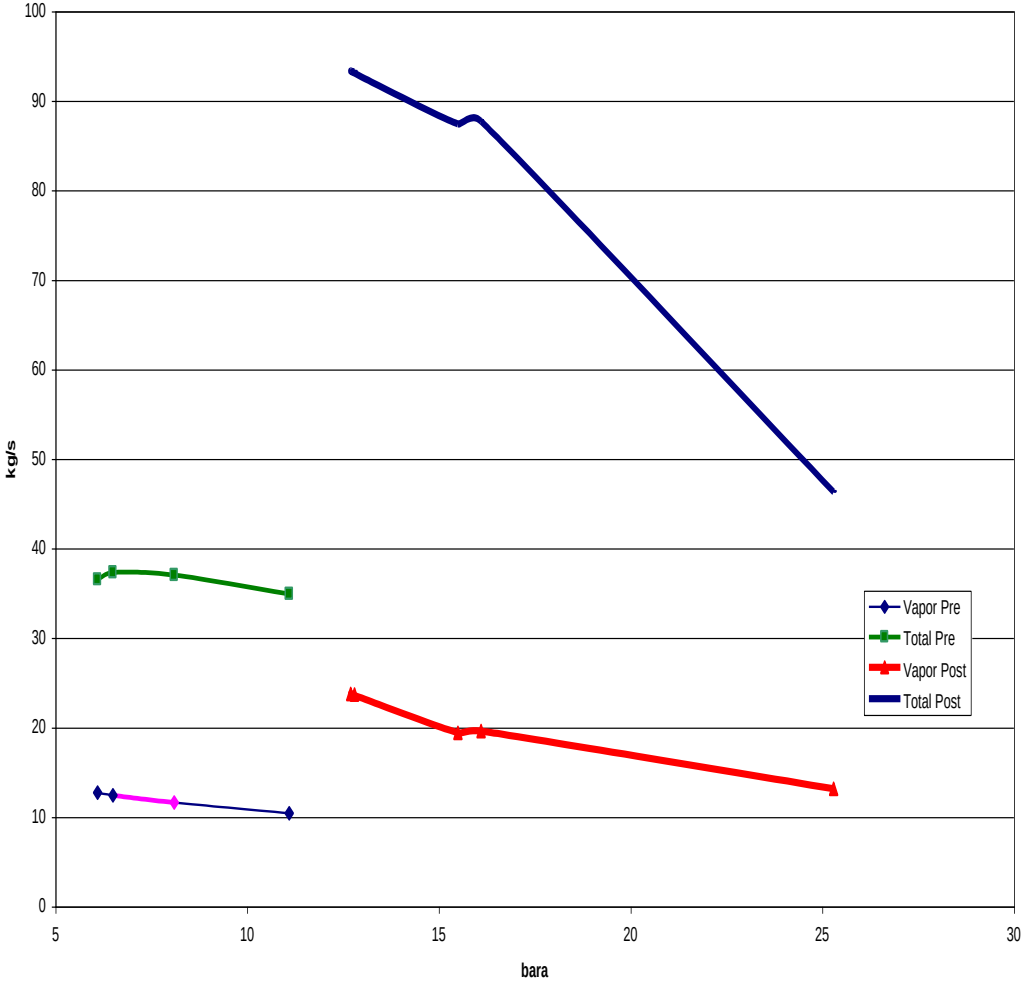
Numerical modeling for the Berlín field





Production enhancement

- Due to mud damage or naturally self sealling formation, permeability in the feed zone could be lower than the expected one
- To enhance the steam production acid injection could be used.
- In 2006 well TR-5B was stimulated using 38 m^3 HCl as preflusing and 57 m^3 of HCL and ammonium bifluorine



Conclusions

- The monitoring is the best way to gatter information from the wells and the whole geothermal system.
- Reservoir engineering technics contribute to welldone field management and the sustainable resource utilization.
- There are several way to increase the energy yield from the reservoir: pressure declining, steam enhance by acid or hidrofracturing estimulation, drilling make up wells, etc.