



39<sup>th</sup> IAH Congress  
Niagara Falls, Canada

Confronting Global Change - September 16-21, 2012

Th1-D Karst Aquifers, Environmental Problems and  
Global Change

Stable isotope studies on altitude effect  
and karst groundwater catchment delineation  
of the Jeita spring in Lebanon

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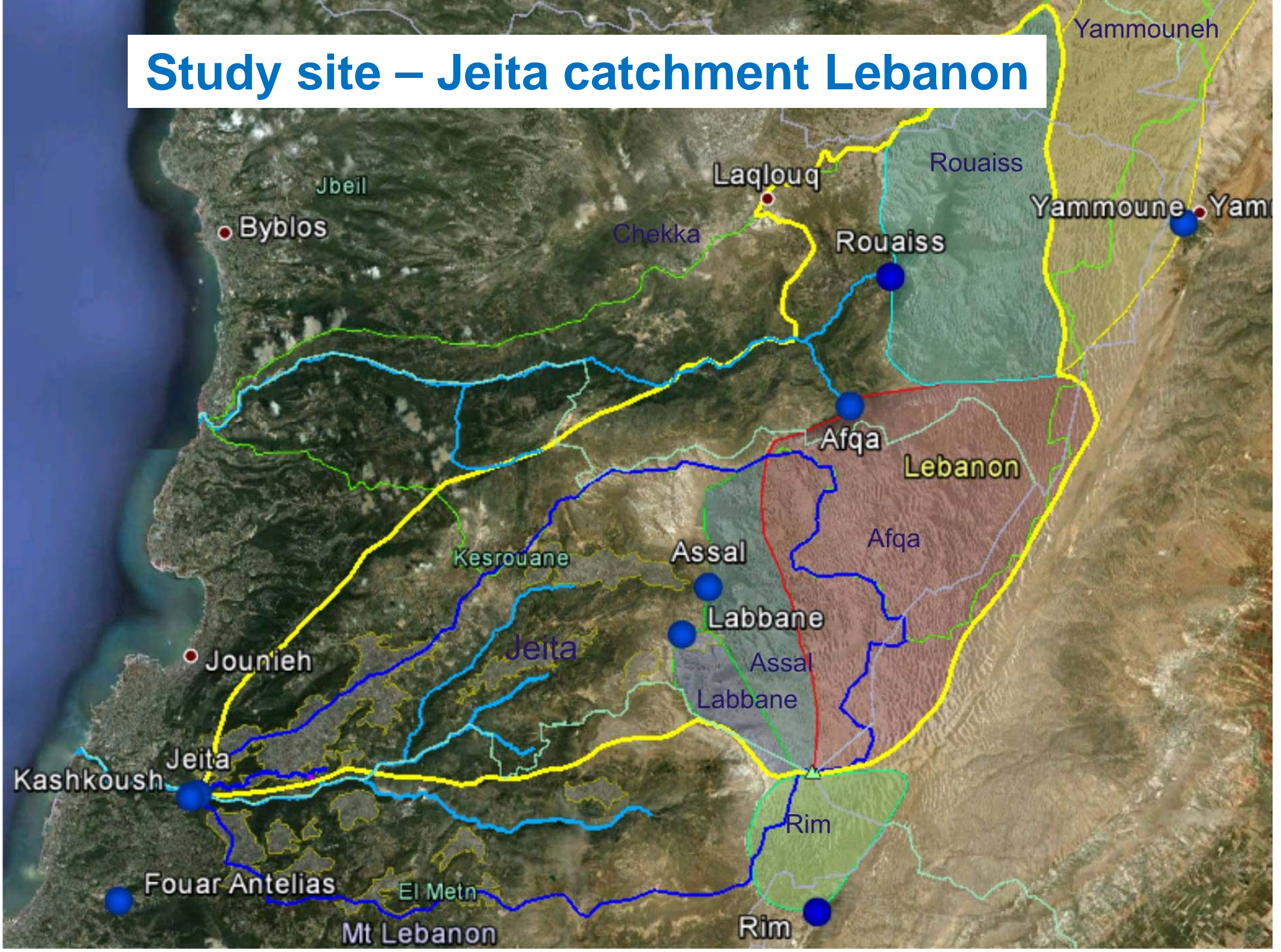
# Outline

- Introduction and objectives
- Study site and methods
- Results
- Discussion
- Summary

# Introduction and objectives

- Jeita spring in Lebanon supplies 75% of drinking water for capital city of Beirut
- Heavily karstified catchment area
- Severe environmental problems due to uncontrolled settlements: (water quality problems >> water quantity)
- Implement stable isotopes for investigation and protection of groundwater resources and to define GW catchments

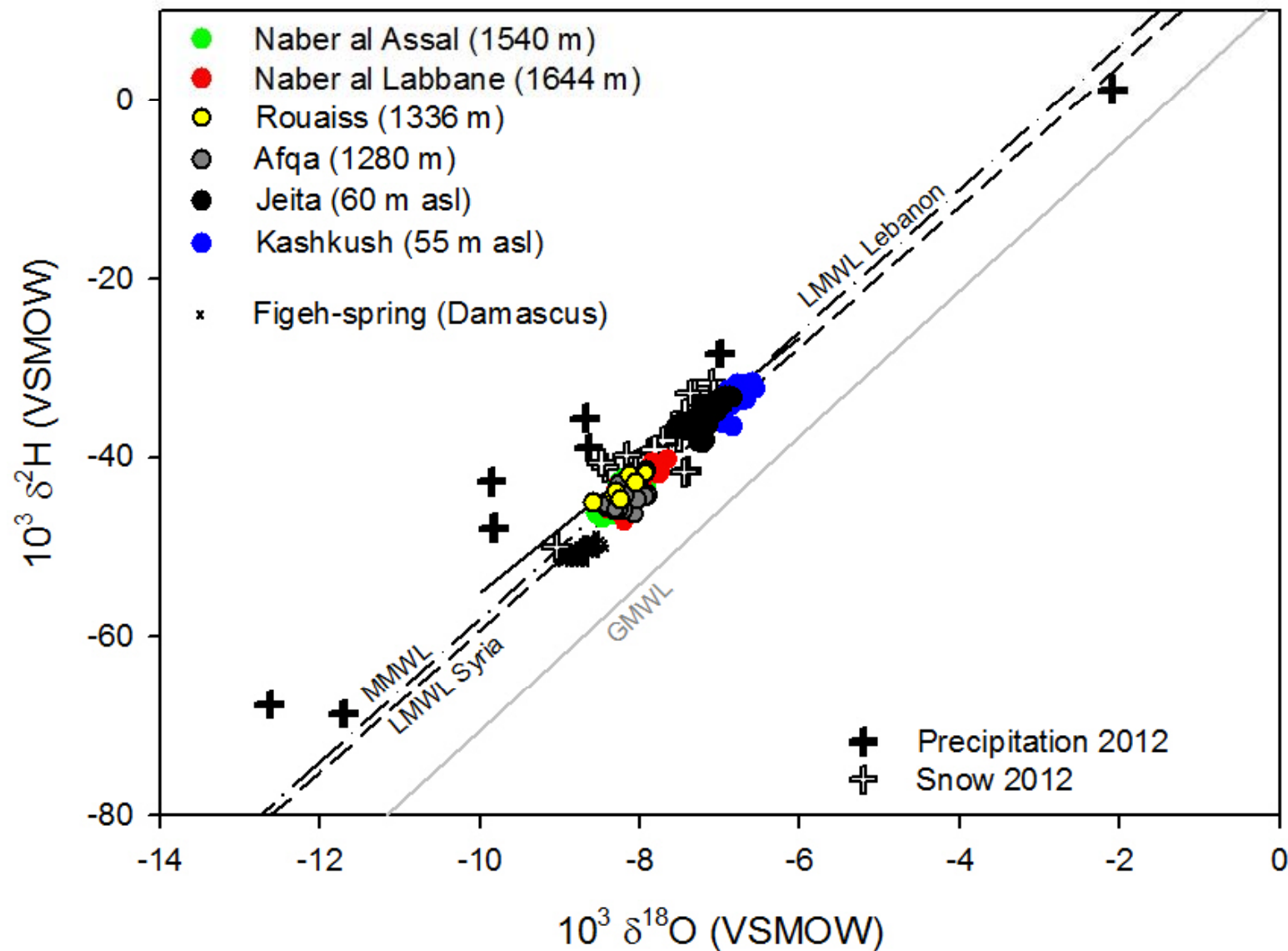
# Study site – Jeita catchment Lebanon

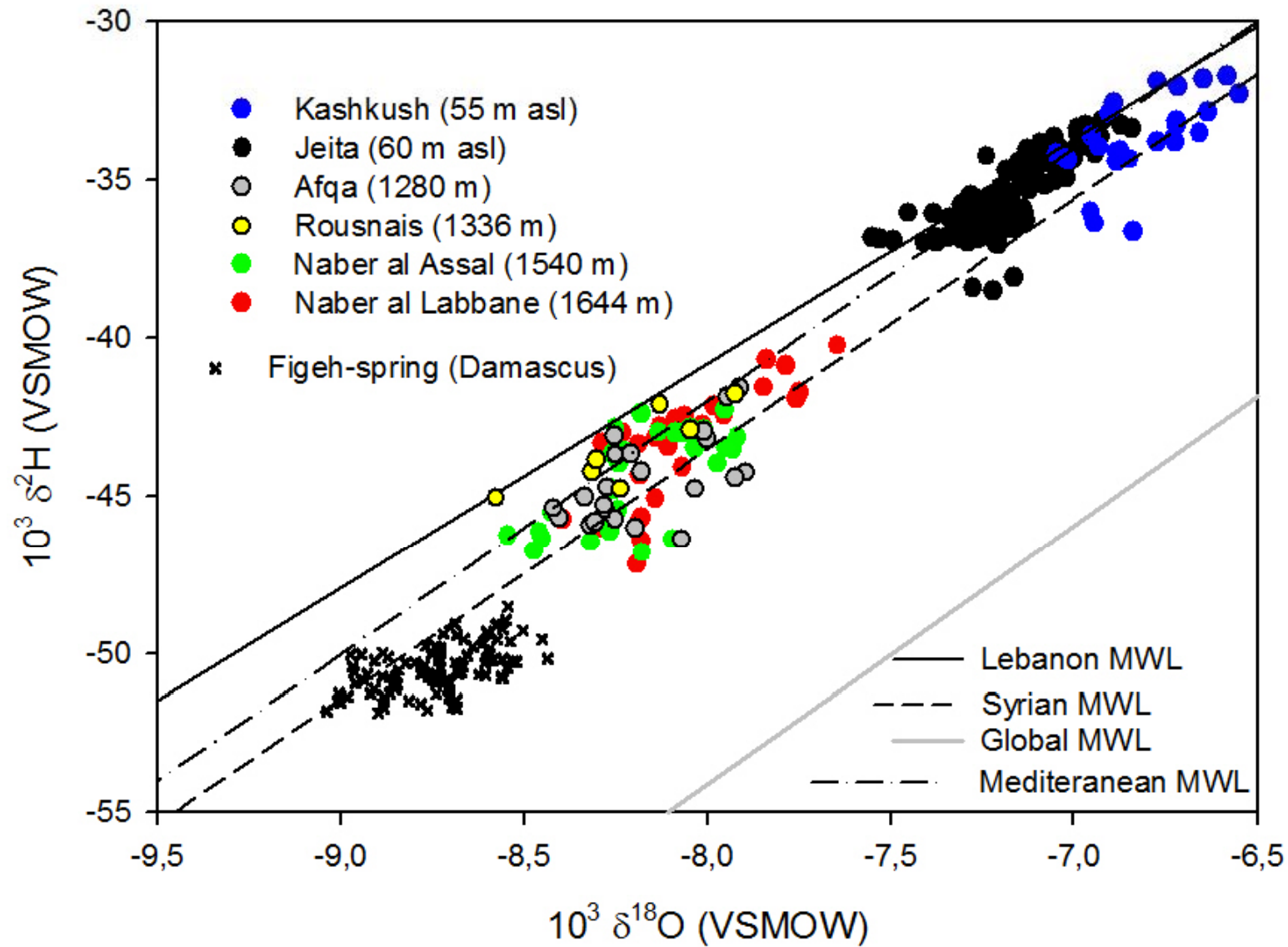


# Study site and methods

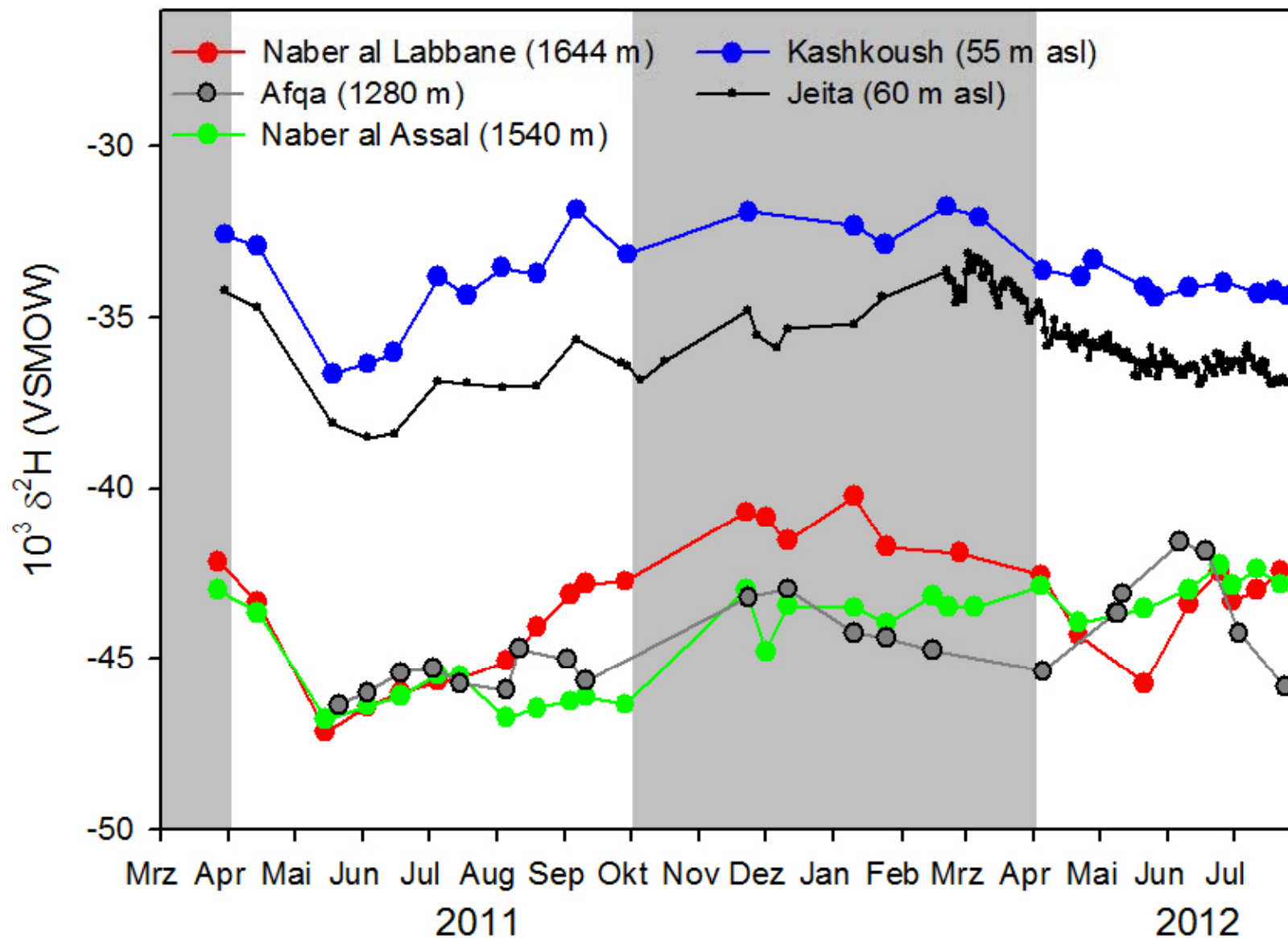
- Geology: Lebanon Mountain range with Cretaceous and Jurassic aquifers
- Climate is Mediterranean with high snowfall in winter ( $P = 900$  to  $>2000$  mm/yr)
- Poor monitoring of meteorological and hydrological data
- Stable isotope sampling of groundwater (six springs) and precipitation; snow sampling campaign during winter 2012
- Altitude effect using available precipitation data

# Results: Oxygen-18 vs. Deuterium plot

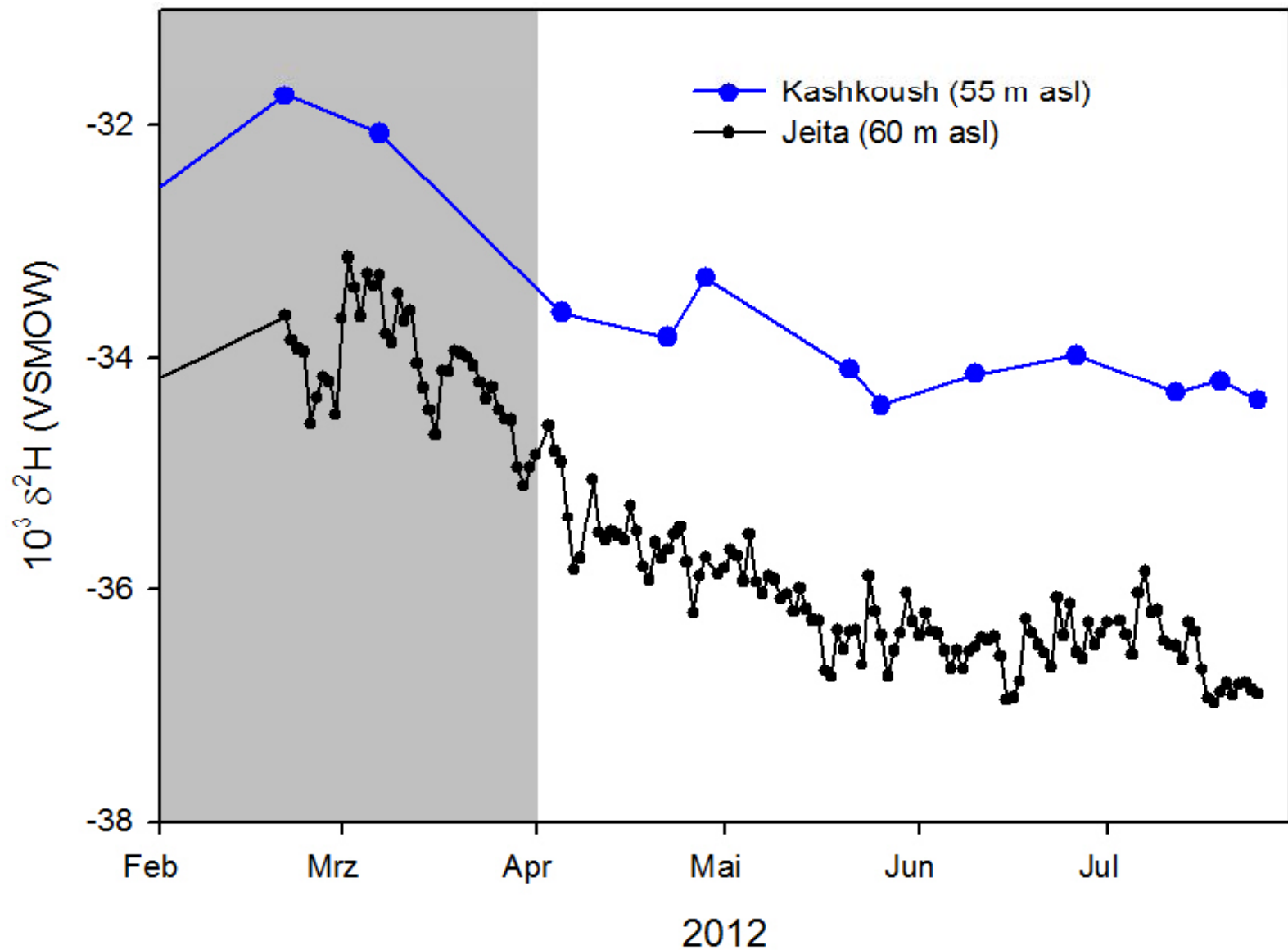


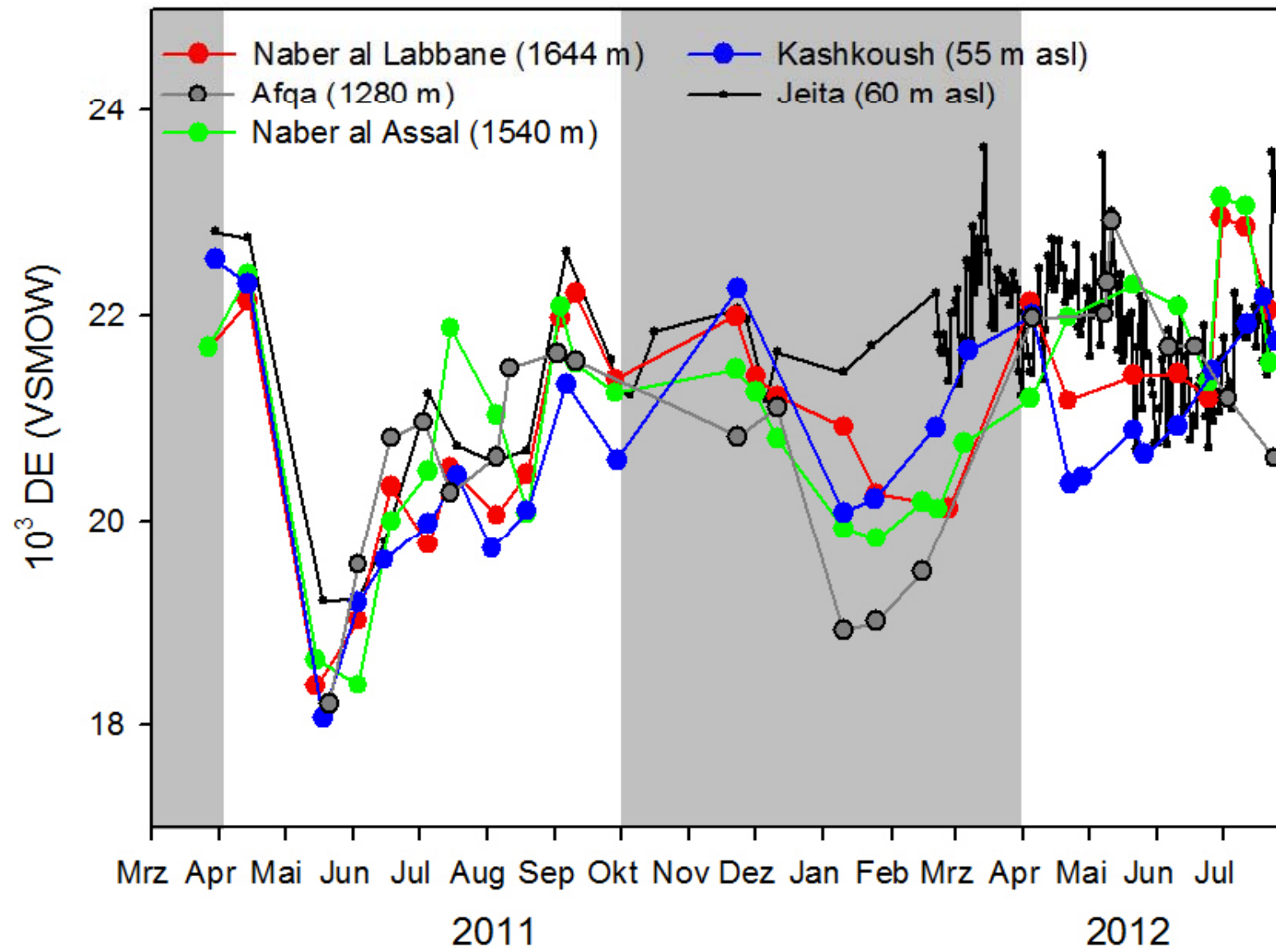


# Results: Deuterium time series of springs

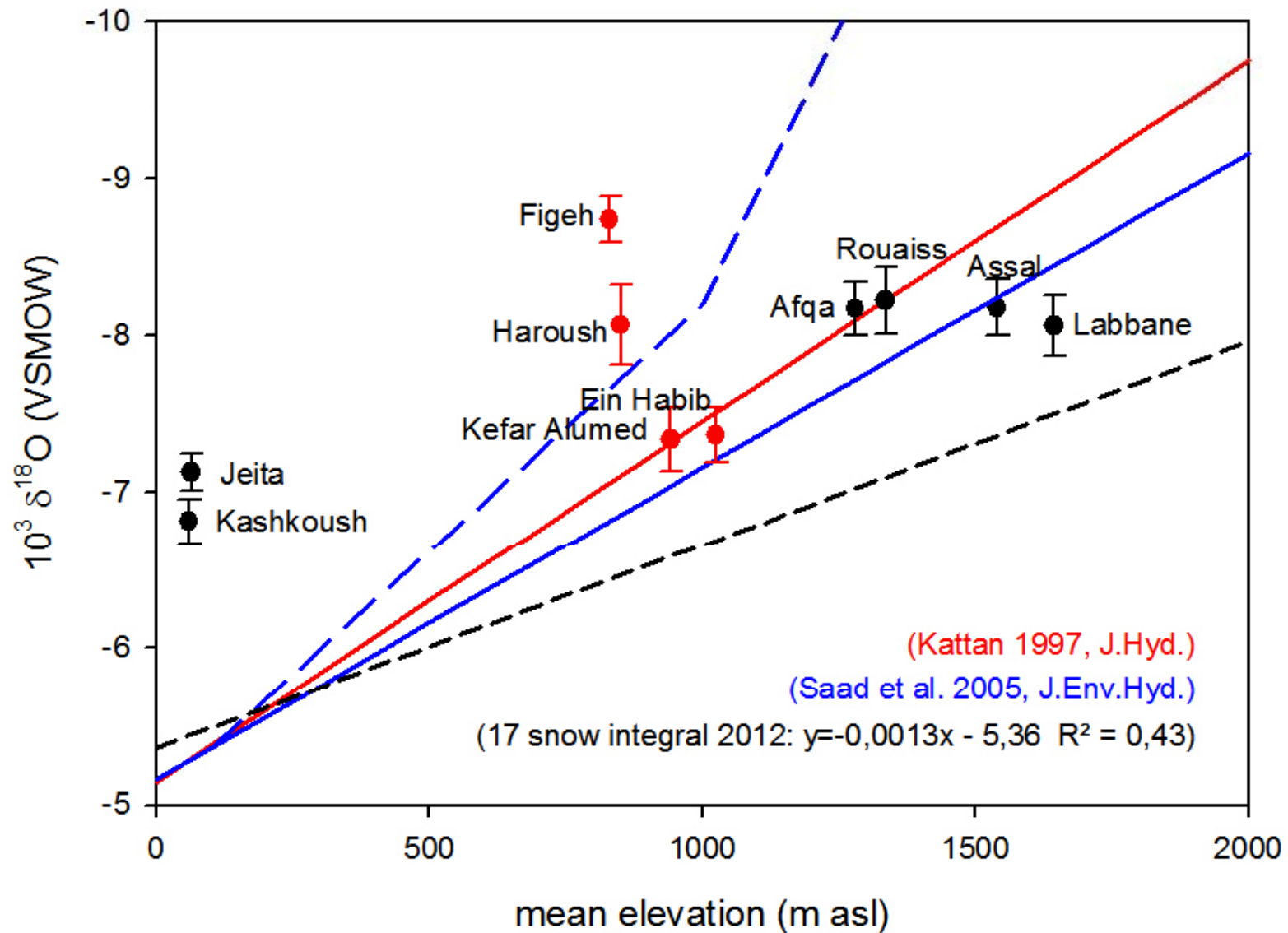








# Results: Altitude effect / catchment altitude



# Conclusions

- Stable isotopes show seasonal variations: indicate fast flow!
- Clear isotopic difference of springs: indicate elevation signal!
- Local meteoric water lines and snow melt contribution unclear!
- Mean catchment elevation is different for Kashkoush and Jeita!
- All springs reflect high deuterium excess values!
- Groundwater age / are there slow components contributing?

# Thanks for your attention

## Acknowledgements

Jean Abi-Rizk  
Renata Raad  
Ayman Ibrahim  
Najib Najib

(Photo: Armin Margane)



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