

Discharge-Duration-Frequency (QDF) Curves for Low Flows: Theoretical Issues and Practical Problems

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and

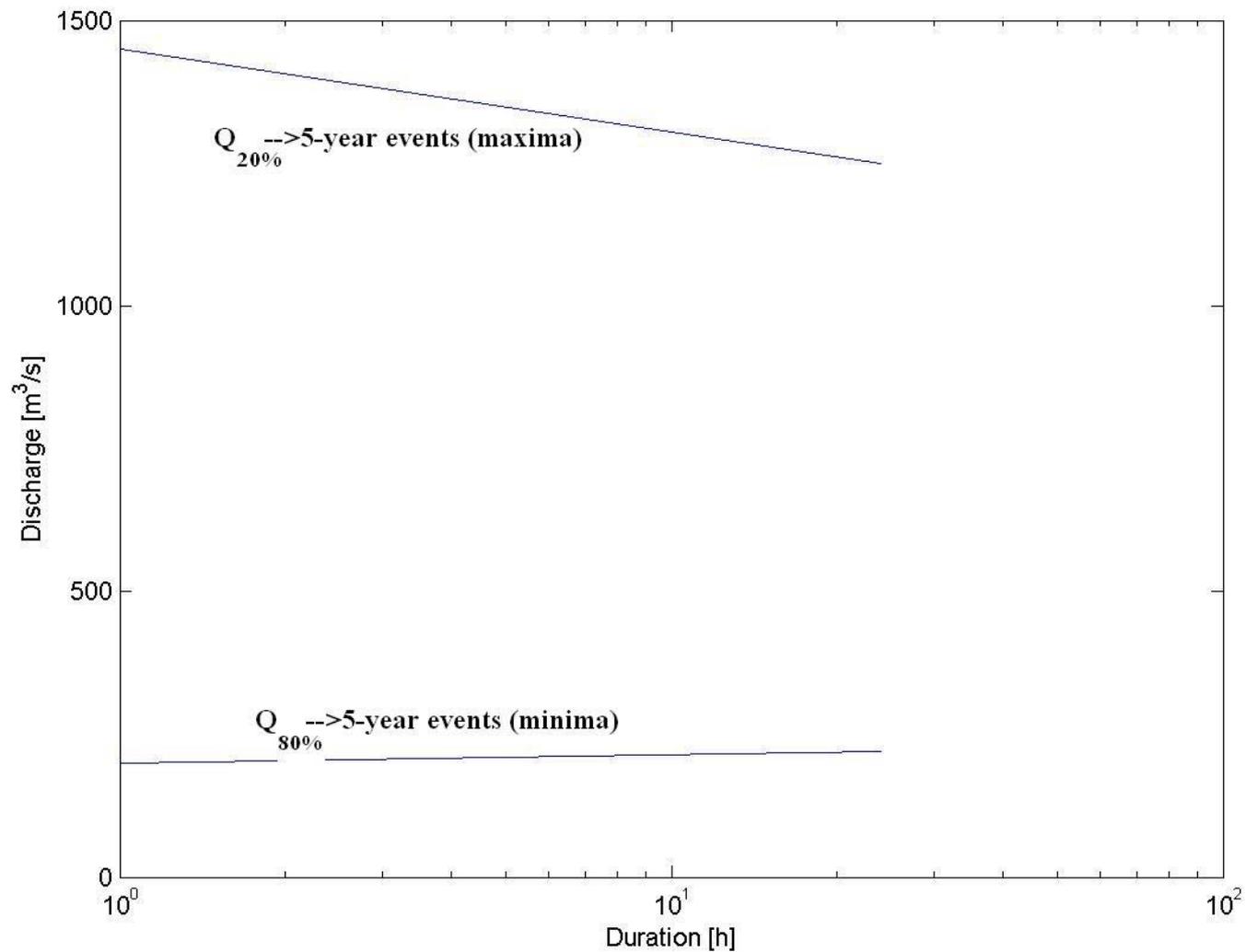
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What are QDFs?

- Discharge-Duration-Frequency curves are a concise form of capturing the information of hydrological-engineering interest from marginal and joint probability distribution functions of a river-discharge stochastic process.
- They are nomograms (for engineers) or else constant-T sections of $Q(T,D)$ surfaces (for more mathematically-inclined scientists).
- Just as IDF curves in Meteorology, QDFs can be used to describe the *hydrological* component of droughts.

A Schematic Representation



Interpretation of QDF Curves

- It depends on their construction, for which there are different methods:
- Duration-D average discharge during an arbitrarily-placed time window (sliding-window estimators);
- Duration-D average-discharge annual maxima/minima;
- ...and others.

Advantages and Drawbacks of Annual Maxima/Minima-Based Curves

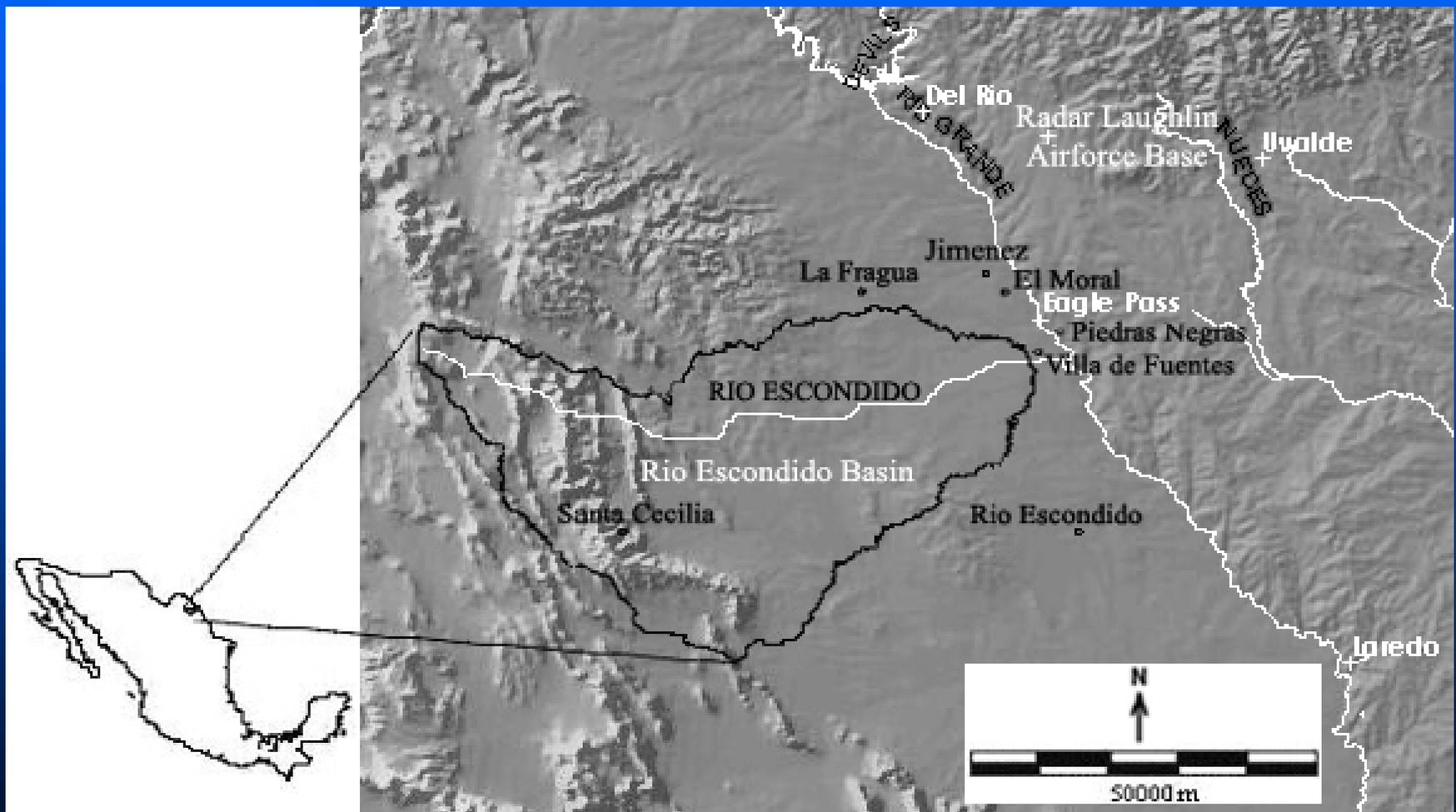
■ Advantages:

- They make sense w.r. to the annual hydrological cycle.
- The interpretation of frequencies vs. annual probabilities is simple (notwithstanding the ergodicity assumption underlying estimations).

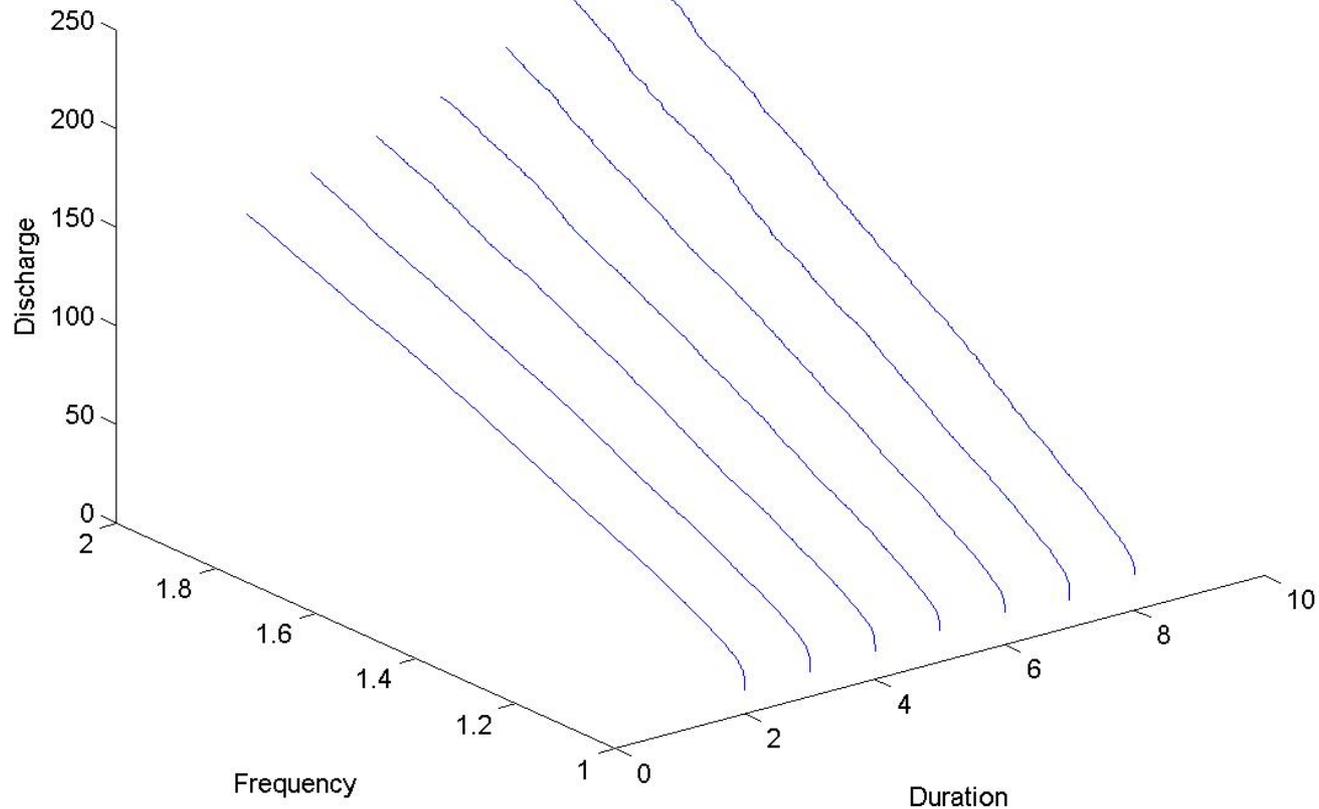
■ Drawbacks:

- They are not appropriate for engineering use.
- The maxima/minima transposition is non-trivial.

Mexican Example: The Río Escondido



Q(D,T) Surface for Río Escondido



Conclusions

- Q(D,P) surfaces allow for an easy swap between maxima and minima of discharges of different durations.
- They are comprehensive in scope and appropriate for engineering use.
- BUT: There is a need for decision makers to understand the basics of their functioning (not every detail, the BASICS).