

*European Geosciences Union General Assembly  
19-24 April 2009, Vienna, Austria*

***Annual Rainfall Maxima:  
Large-deviation Alternative to Extreme-  
value and Extreme-excess Methods***

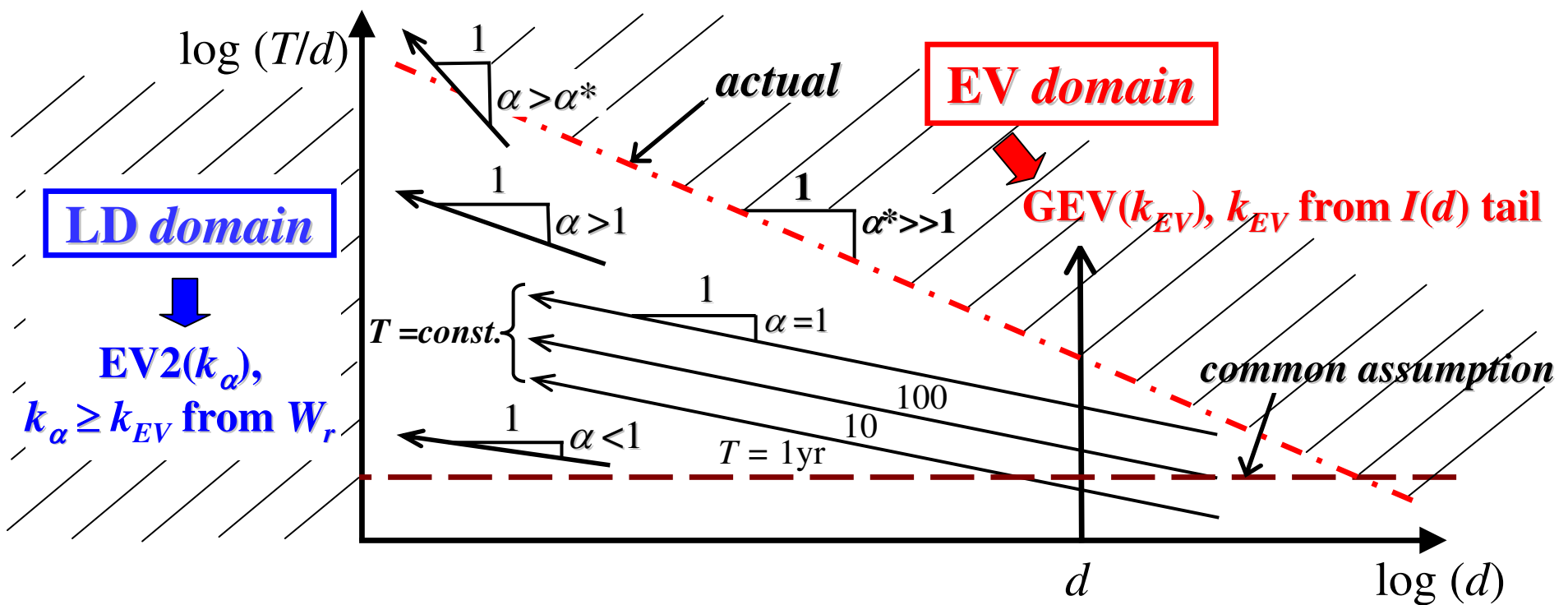
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# The Problem of Rainfall Extremes

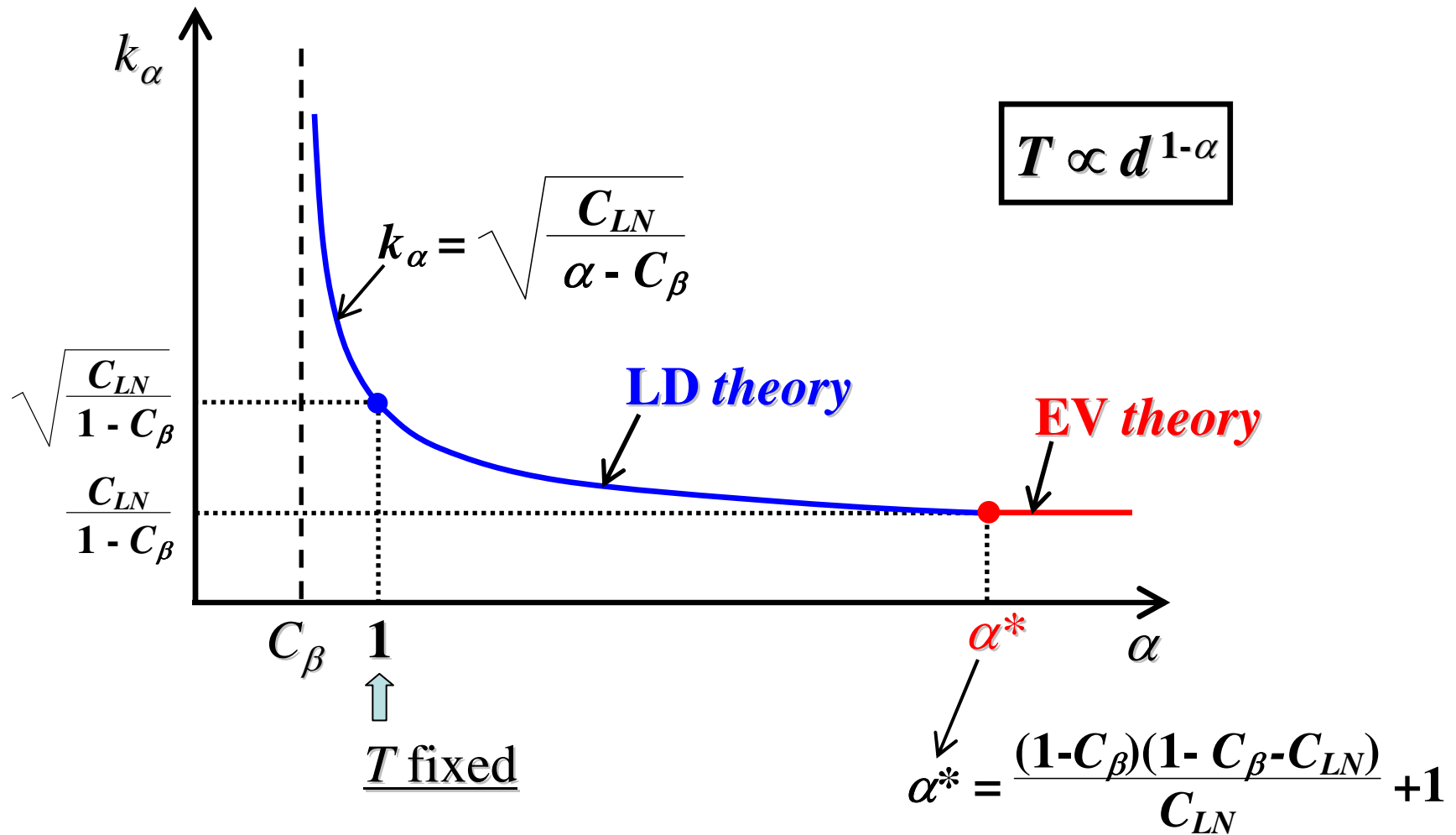
$$\begin{cases} I_{max,T}(d) = \max \{ I_1(d), \dots, I_{T/d}(d) \} \\ \text{MF: } I(d/r) = W_r I(d) , \quad d < D \end{cases}$$

## Asymptotics

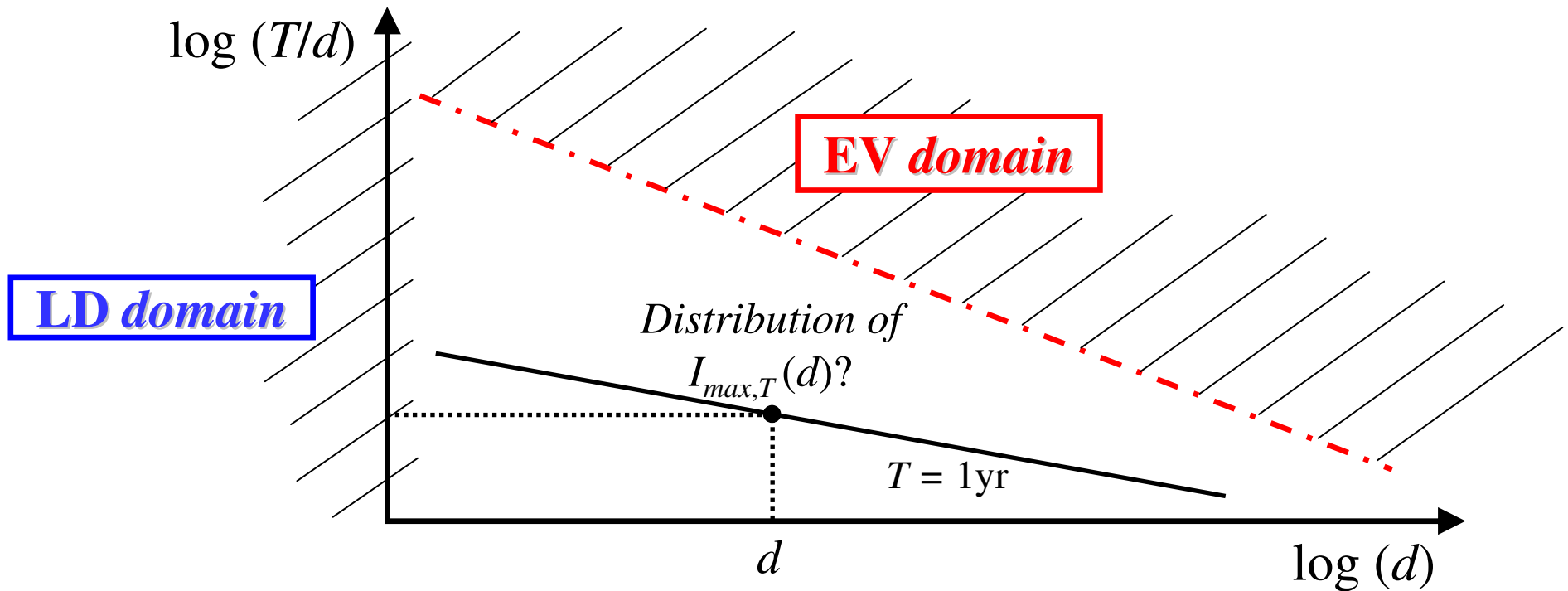


# Asymptotics: Example

➤ Beta-lognormal MF process with parameters  $(C_\beta, C_{LN})$



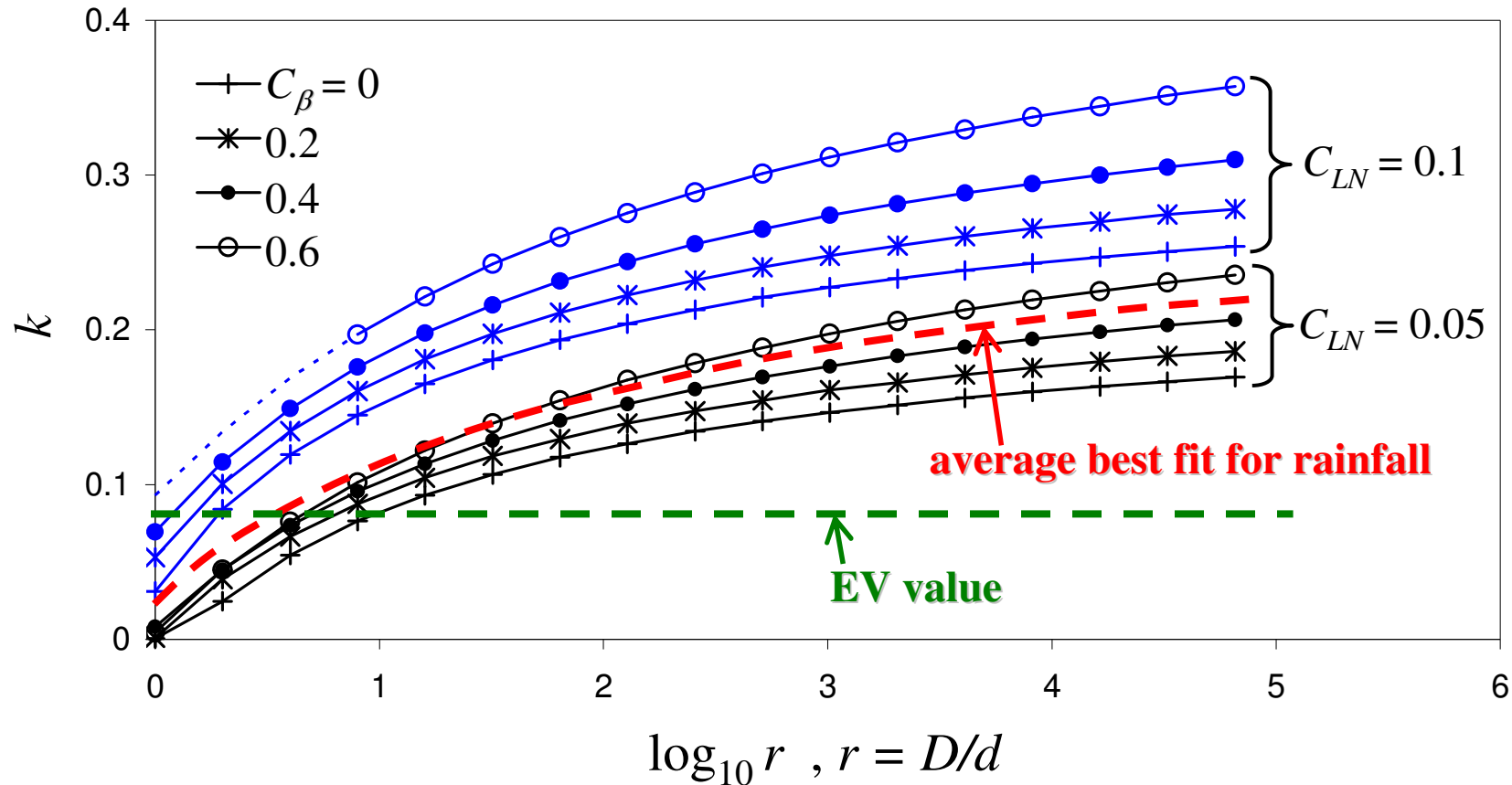
# Non-Asymptotics



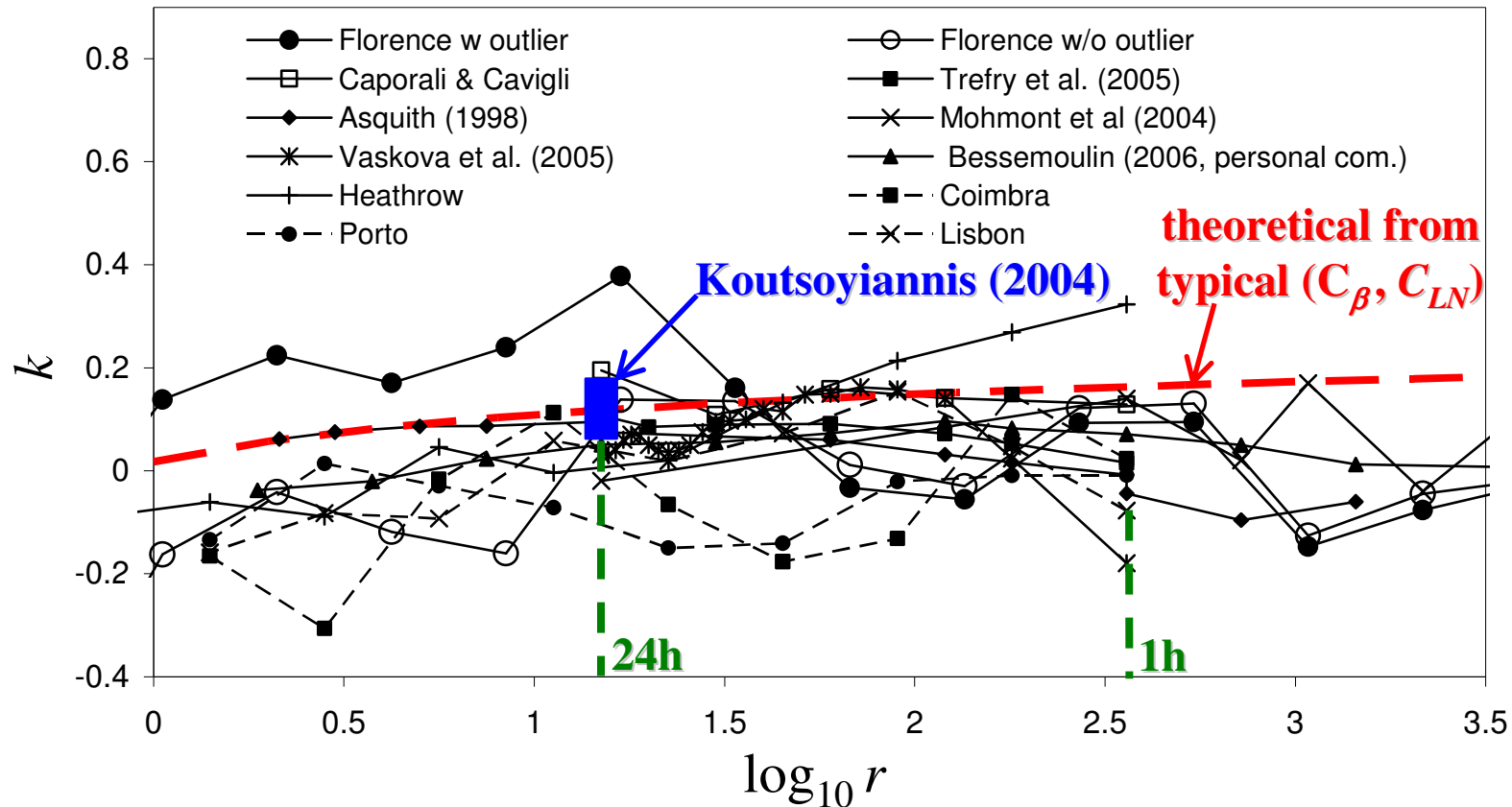
1. Numerical calculation
2.  $GEV(k)$  approximation over a range of or return periods

# Example of GEV( $k$ ) Approximation

- $(C_\beta, C_{LN})$  model
- *Return period range: 1-100 years*



# Theoretical and Empirical $k$ Values



- *Large sample variance*
- *Bias of some methods*
- *Deviations from multifractality*

# Conclusions

- The **EV conditions are not met by annual rainfall maxima**
- **LD theory asymptotics**  $\left\{ \begin{array}{l} (d \rightarrow 0, T = \text{const.}) \Rightarrow I_{max,T}(d) \sim \text{EV2}(k) \text{ with } k \gg k_{EV} \\ (d = \text{const.}, T \rightarrow \infty) \Rightarrow \text{EV theory} \end{array} \right.$
- **Non-asymptotics**  $\left\{ \begin{array}{l} \text{GEV}(k) \text{ approx. over a range of return periods} \\ \text{Mild dependence of } k(d) \text{ on MF parameters} \end{array} \right.$
- **Implications for IDF estimation**  $\left\{ \begin{array}{l} \text{Poster\# XY728 (EGU2009-6357)} \\ \text{Thursday, 23 April 08:00–19:30, Halls X/Y} \end{array} \right.$