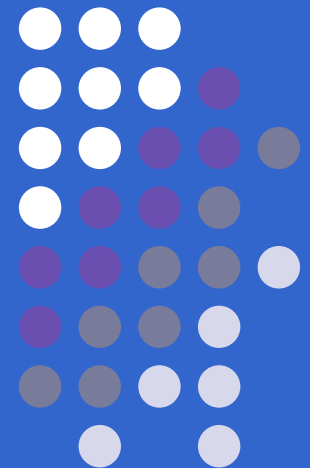


A Contaminant Fate and Transport Model

Laguna di Venezia –

CORILA Annual Reunion
Research Line 3.8
April 27, 2006



J.K. Sommerfreund & M. L. Diamond
University of Toronto, Toronto, Canada

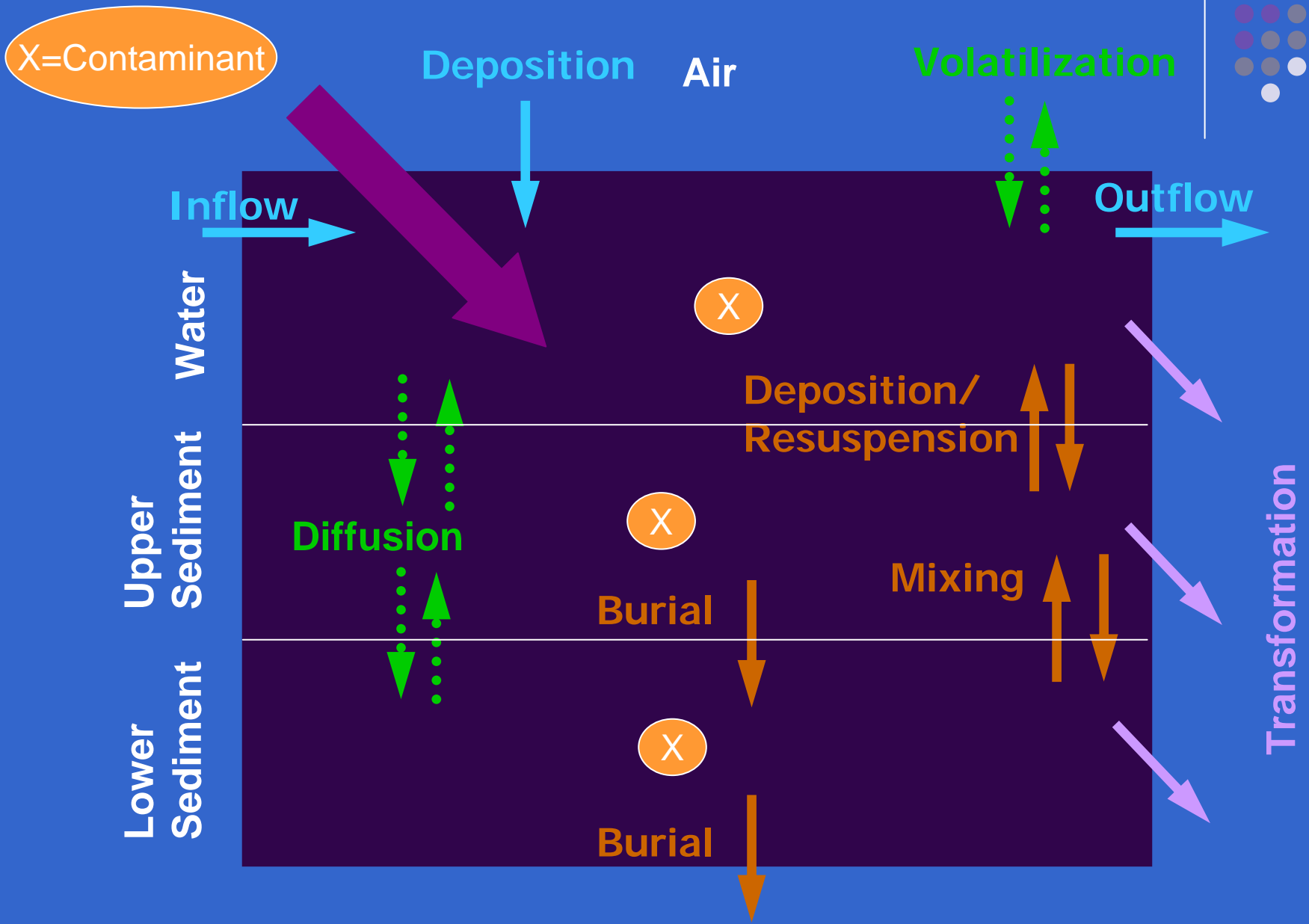
Research Goals



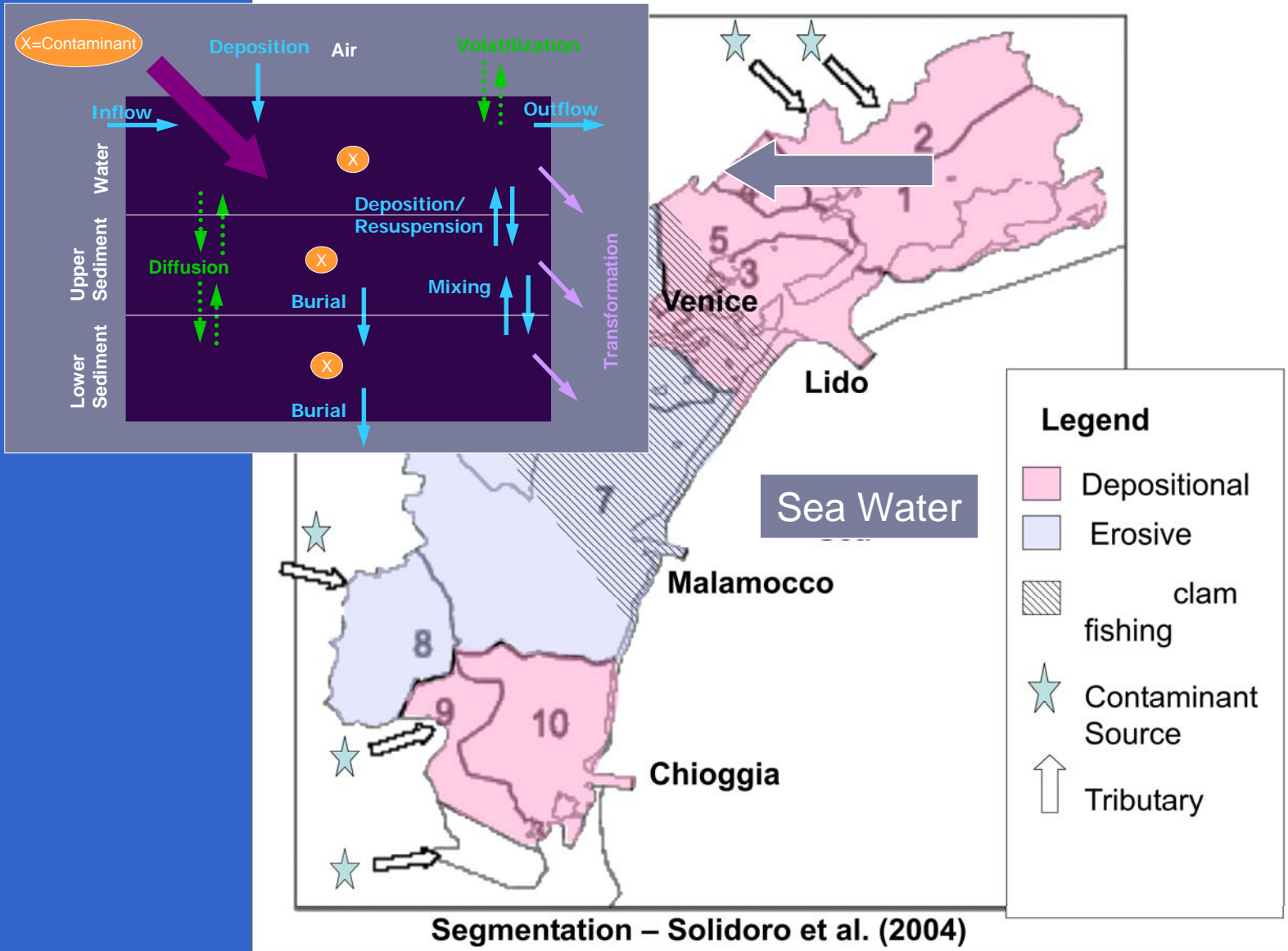
- Sources
- Transport pathways
- Export to the Adriatic Sea
- Coupling of compartments in shallow water body
- Estimate contaminant concentrations



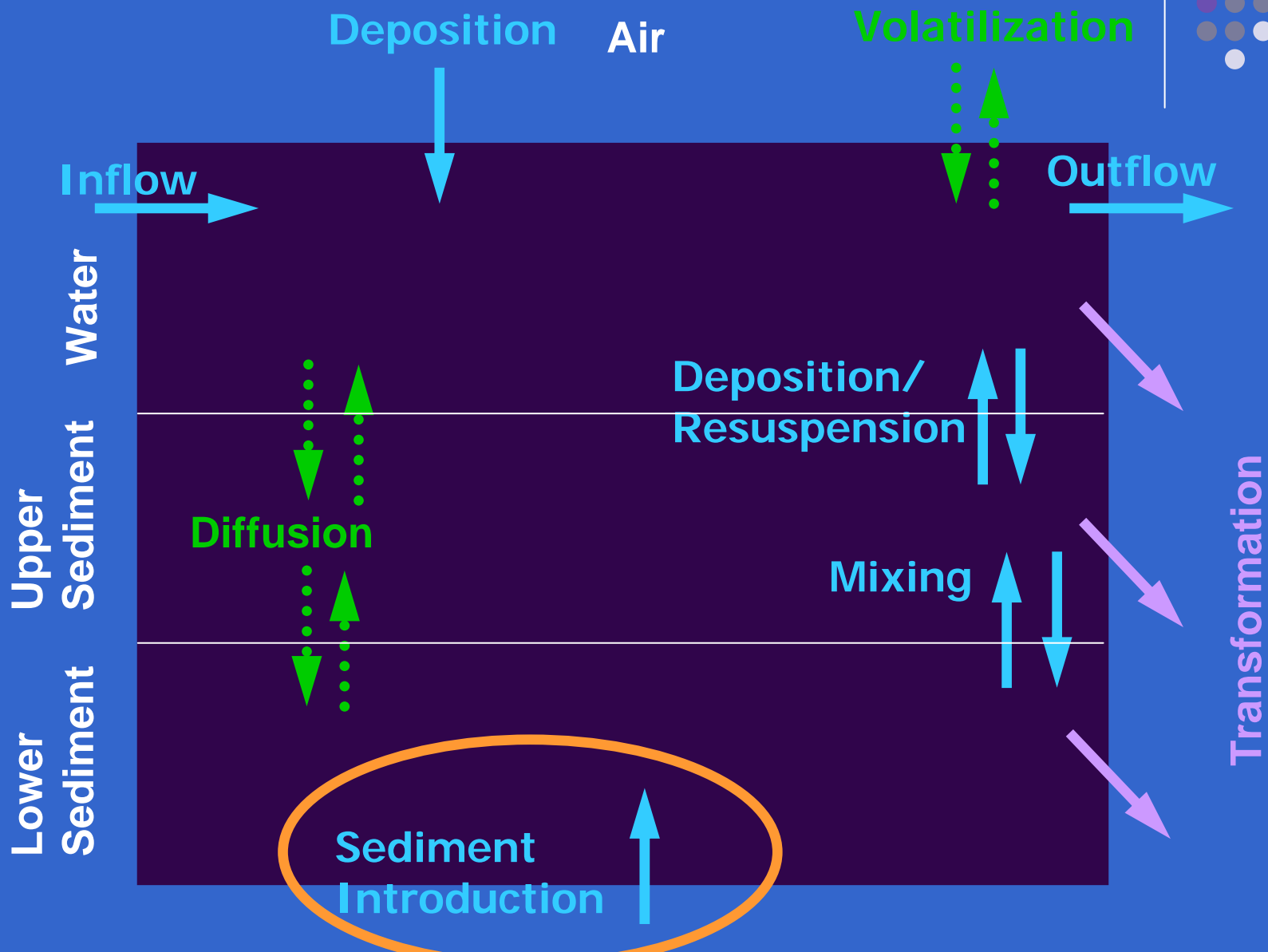
Fate and Transport Mass Balance Model



Segmentation



Fate and Transport Erosive Segment



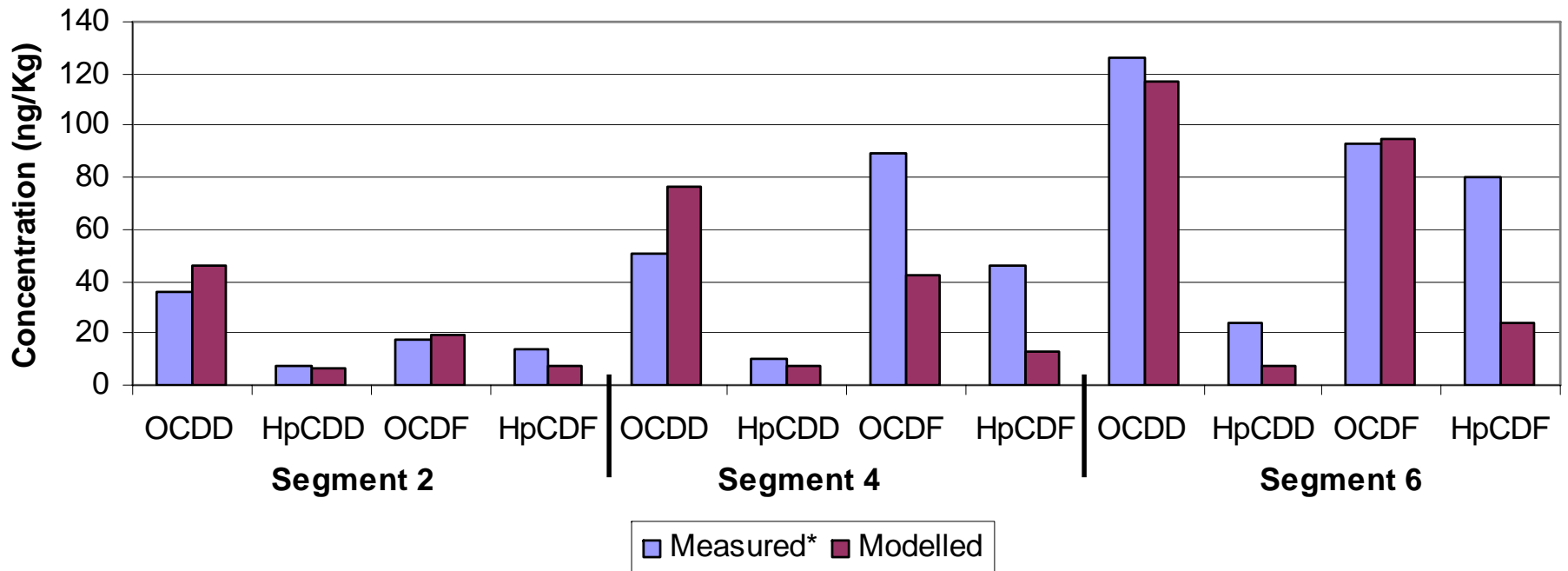


Model Evaluation

Upper Sediment



Relative Error = 28-36 %



* Frignani et al., *Project 2023*

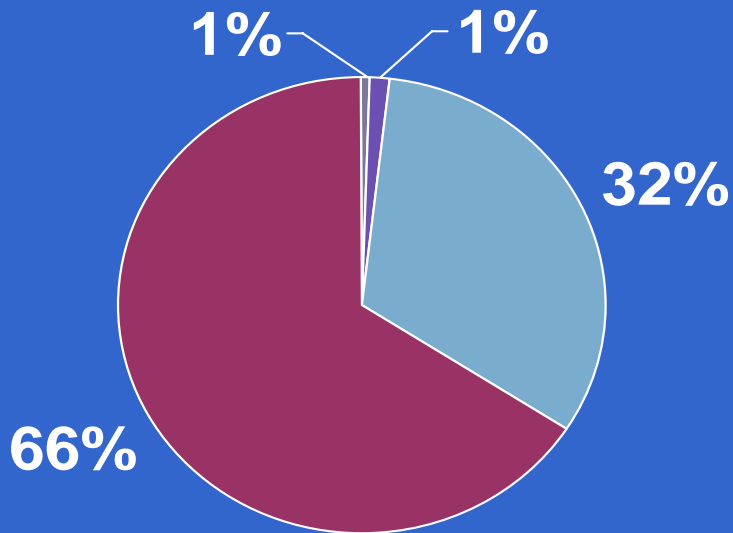


Results

PCDD/F Sources

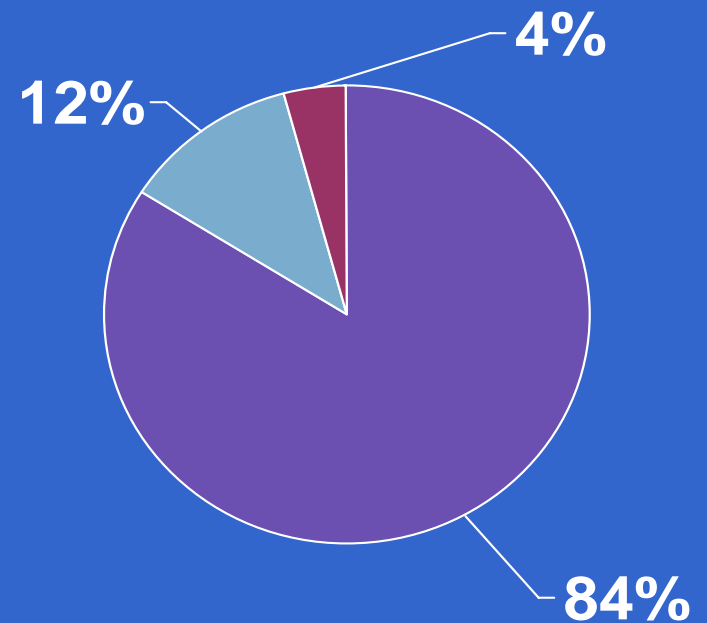


OCDD



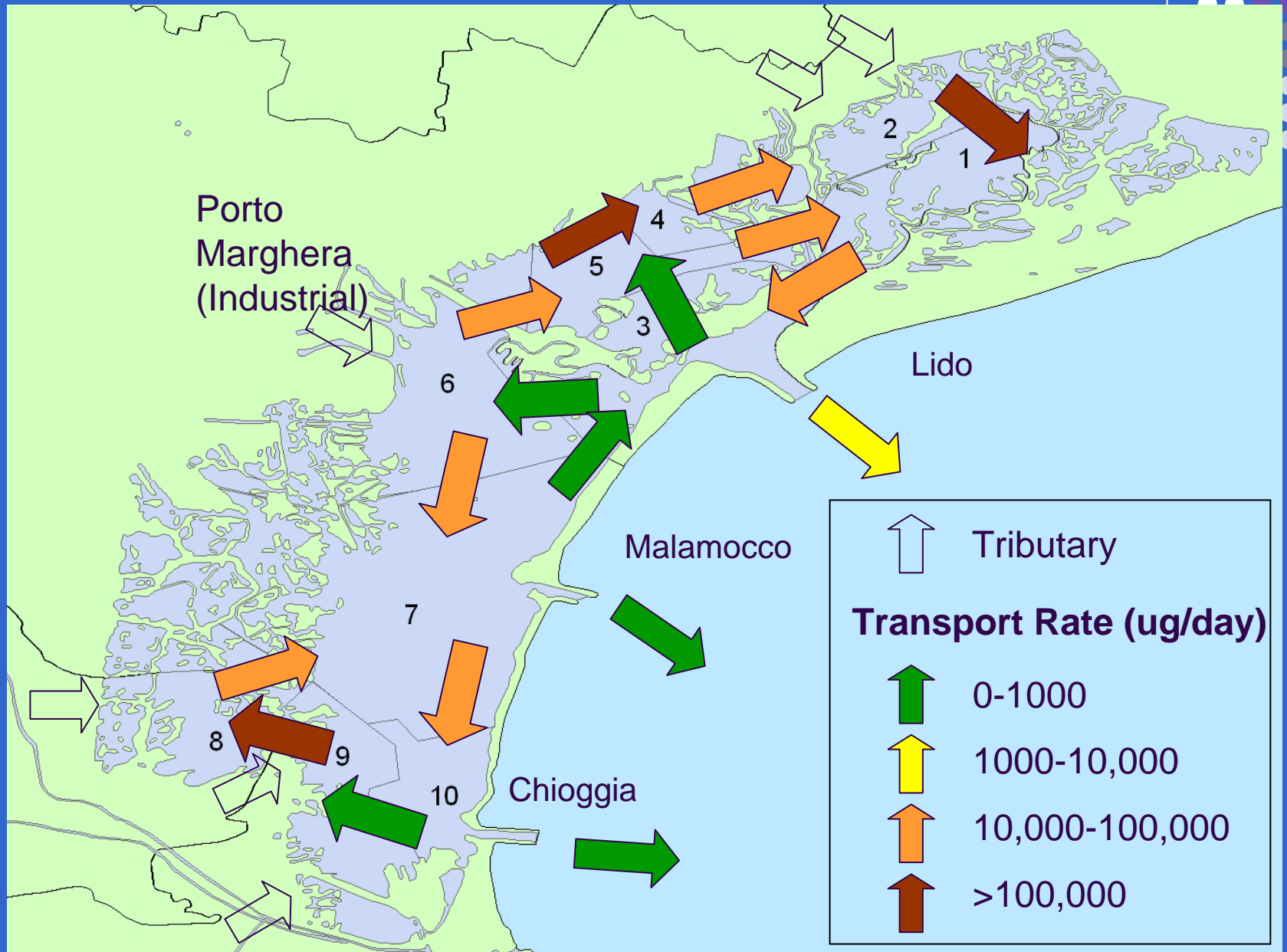
- Atmosphere
- Porto Maghera
- Tributaries
- Deep Sediment

OCDF

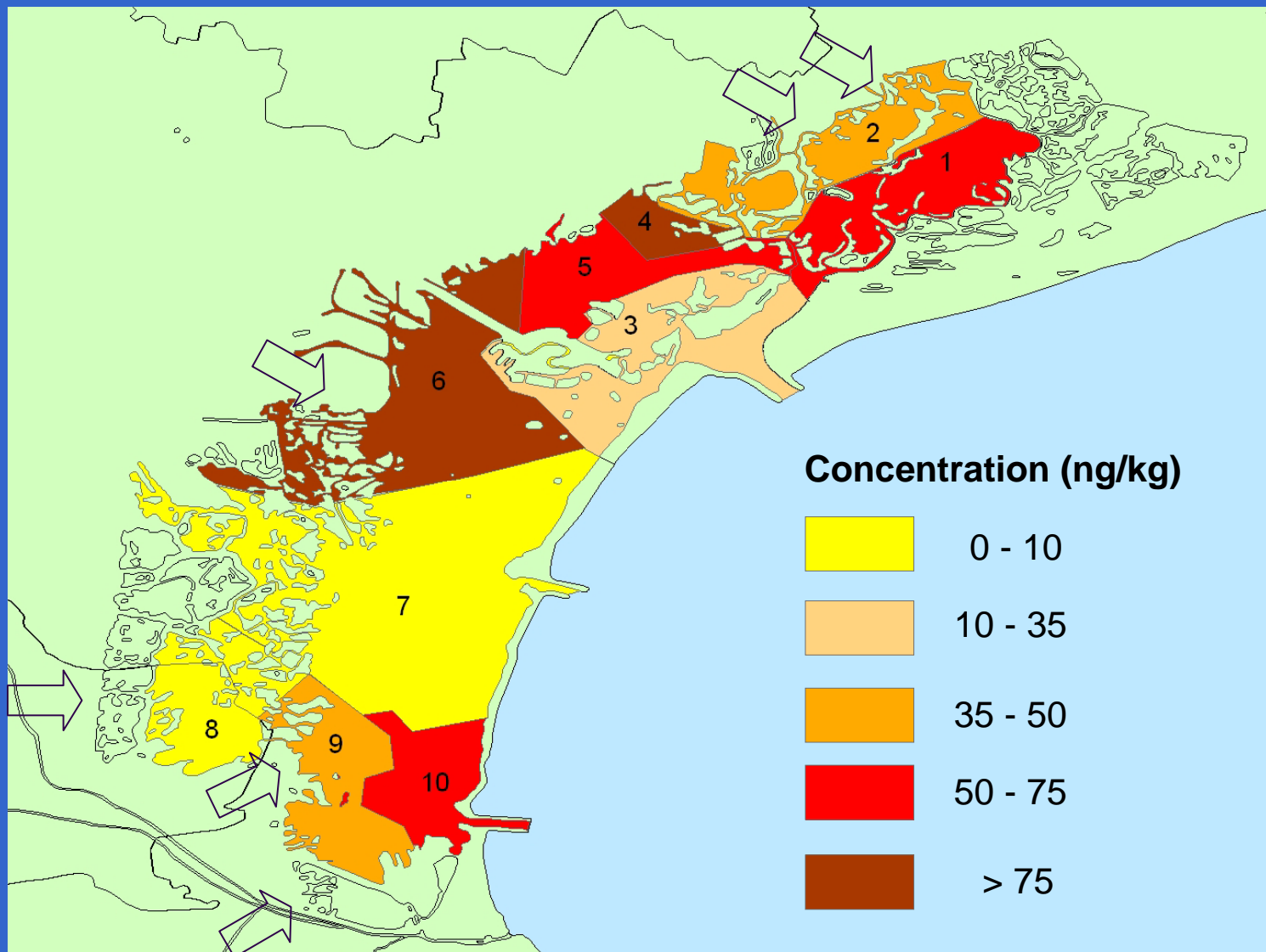


- Atmosphere
- Porto Maghera
- Tributaries
- Deep Sediment

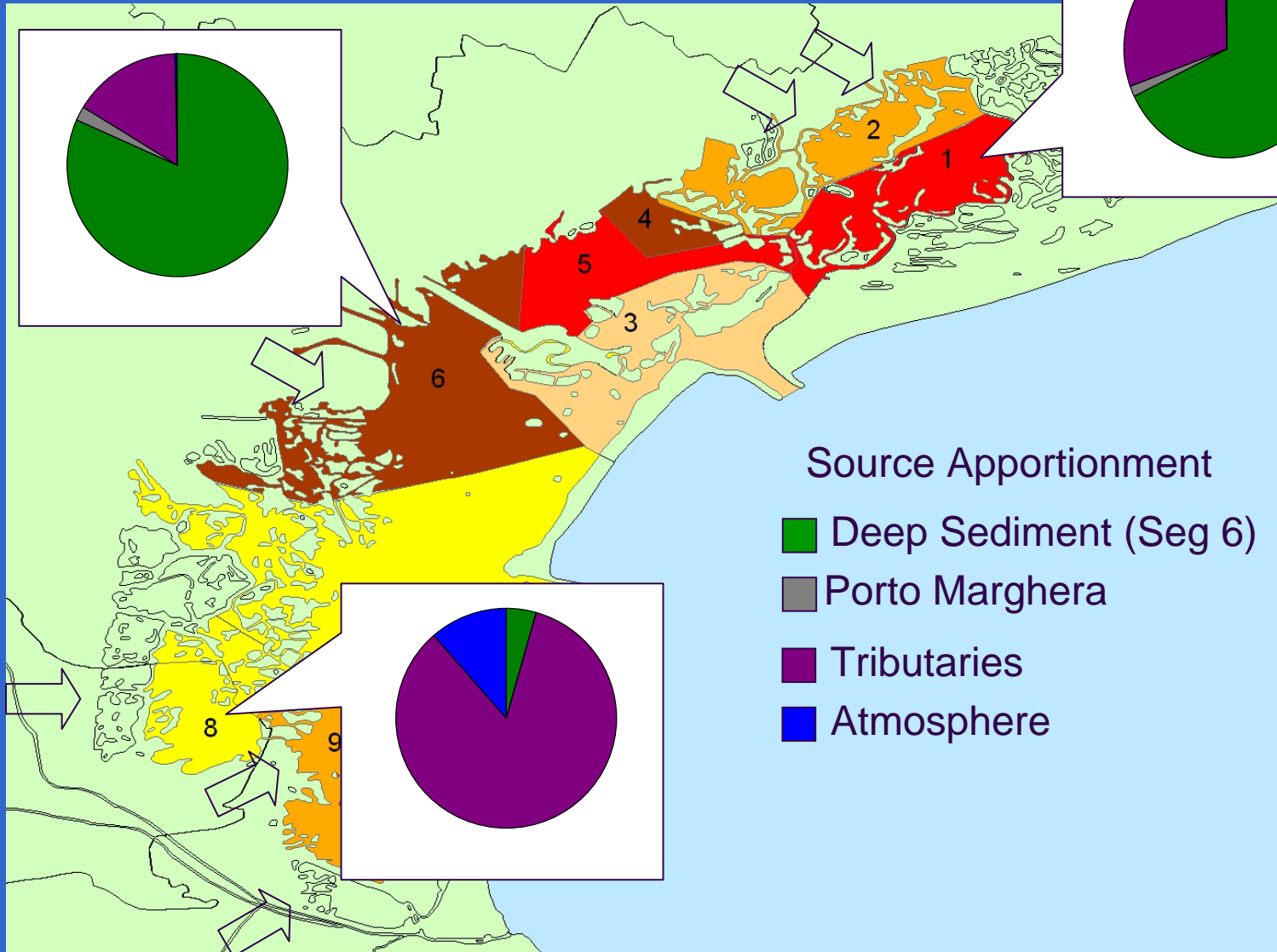
Inter-segment OCDD Circulation



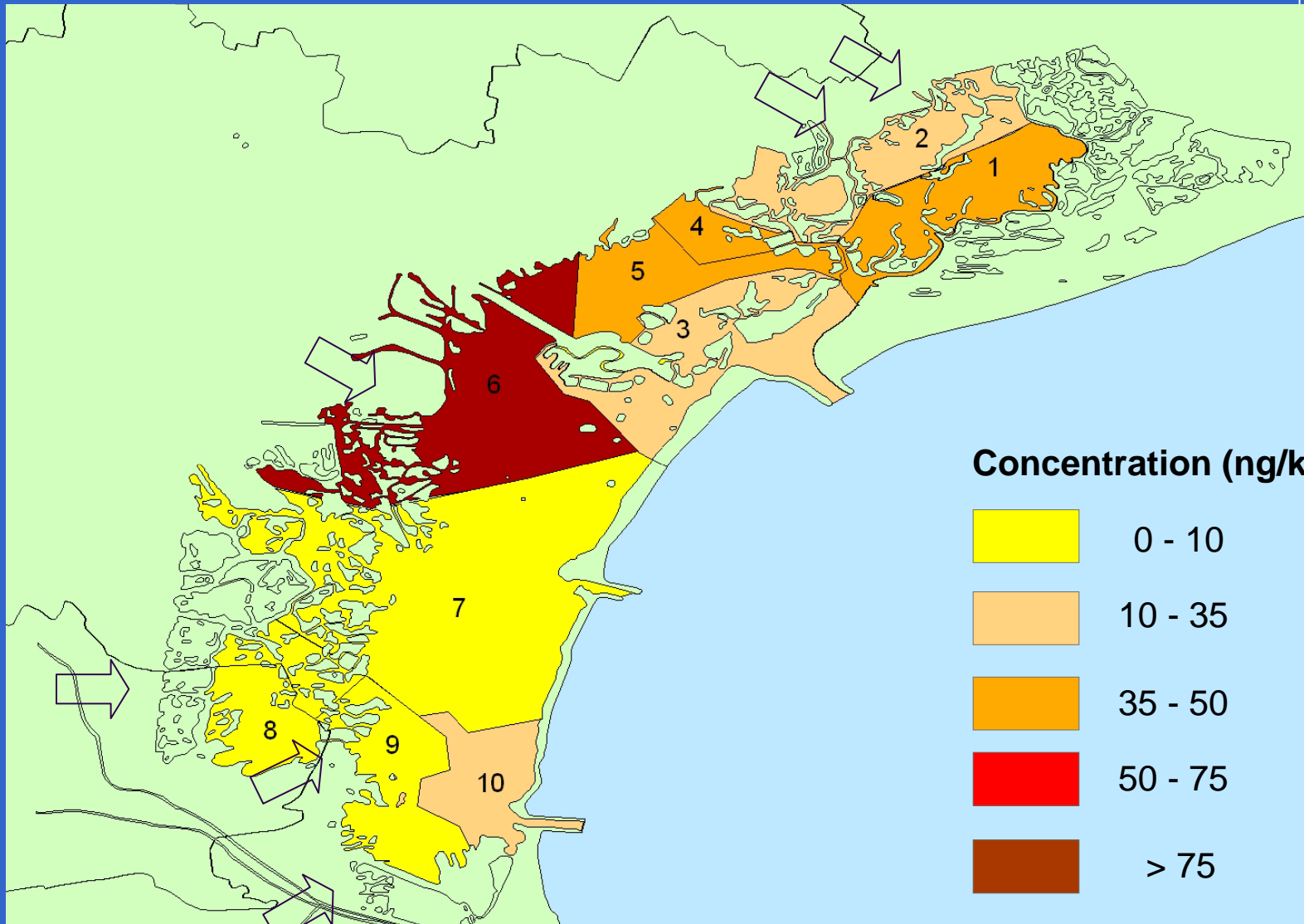
Estimated OCDD Upper Sediment Concentration



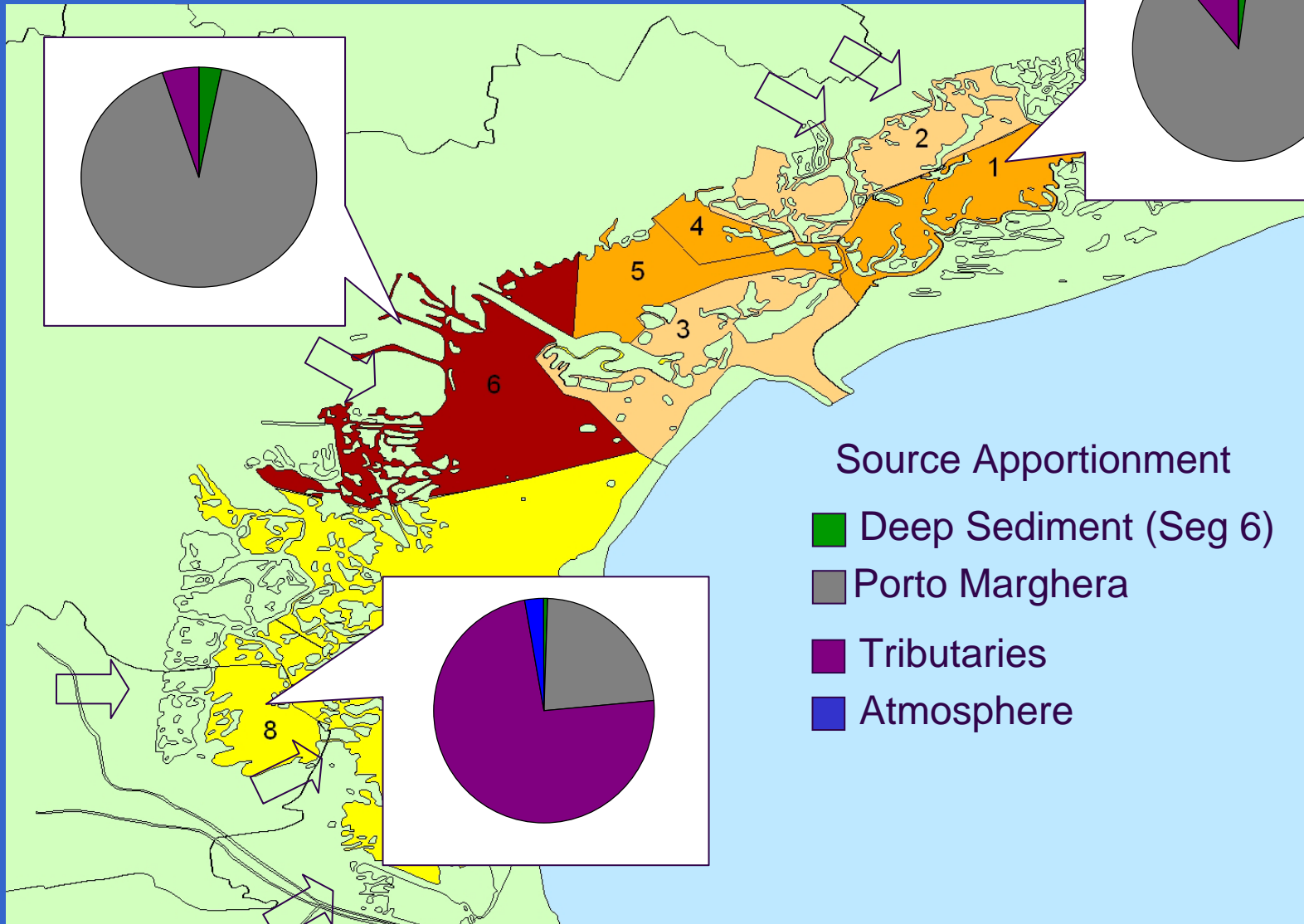
Estimated OCDD Upper Sediment Concentration



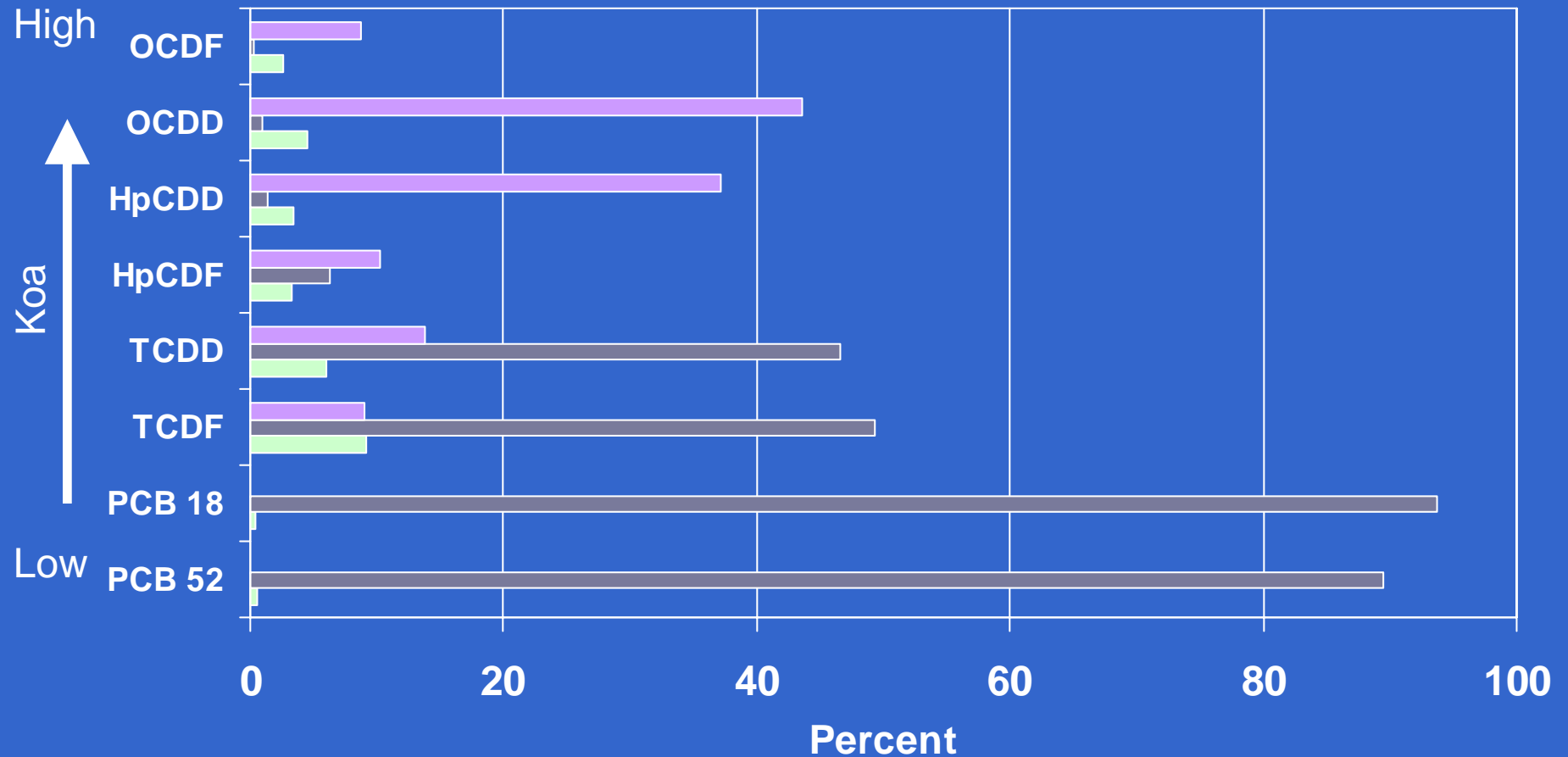
Estimated OCDF Upper Sediment Concentration



Estimated OCDF Upper Sediment Concentration



System Removal



% Export



% Volatilization



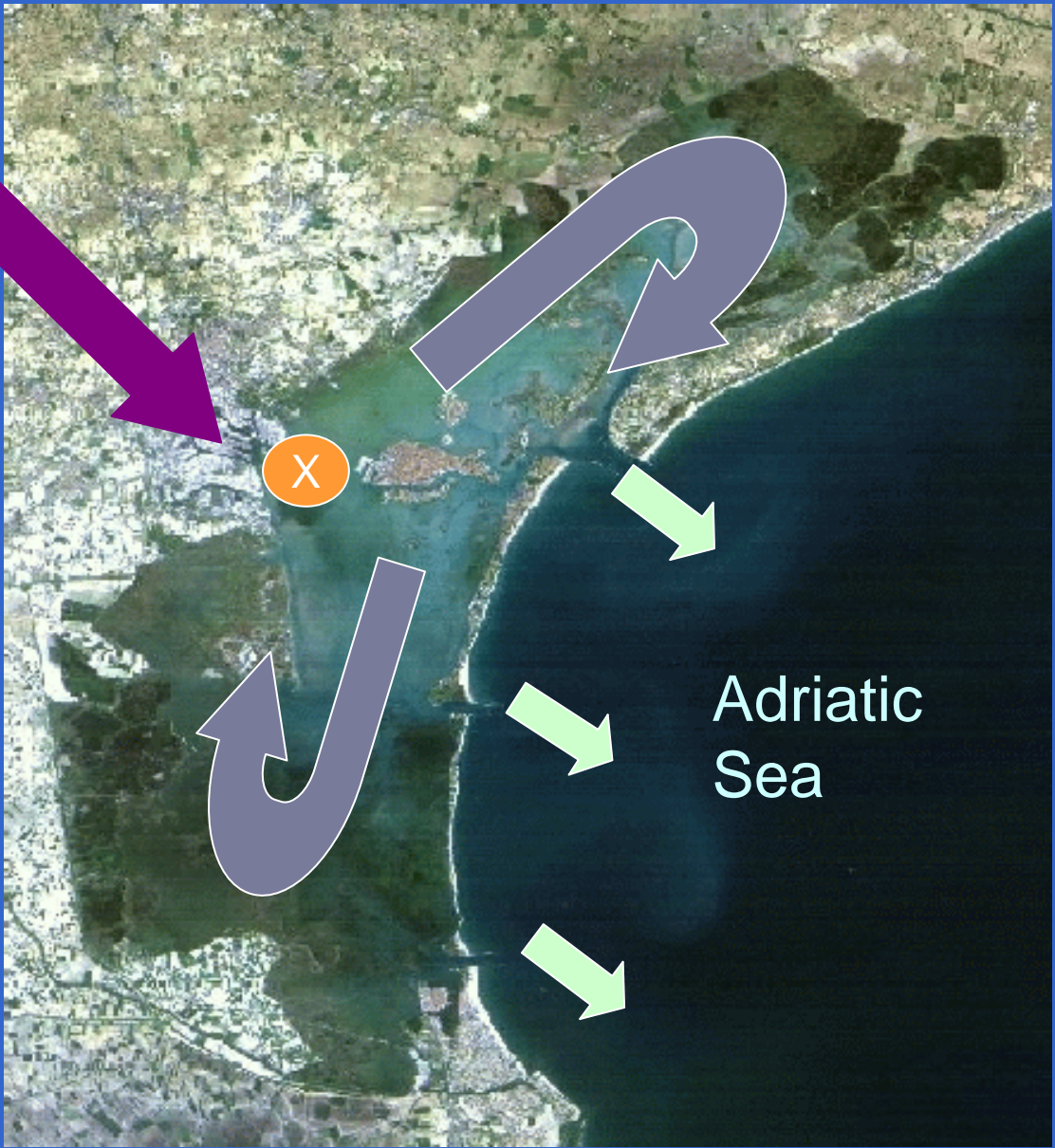
% Burial



Steady-State Fate



X=Contaminant



Adriatic
Sea

Conclusions



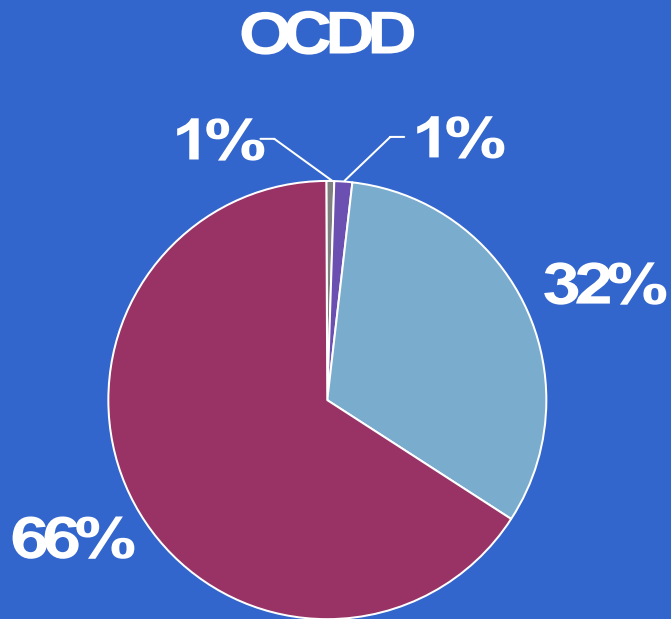
- Sources
 - OCDD – Mixing & resuspension of buried sediment
 - OCDF – Porto Marghera, resuspension of surface sediment
- Transport pathways
 - Throughout lagoon – particle transport, burial
 - K_{OA} – volatilize
- Export to the Adriatic Sea
 - 0-10%
- Coupling of compartments in shallow water body
 - Fugacity ratios show close coupling due to deposition/resuspension
- Estimate contaminant concentrations

Acknowledgements

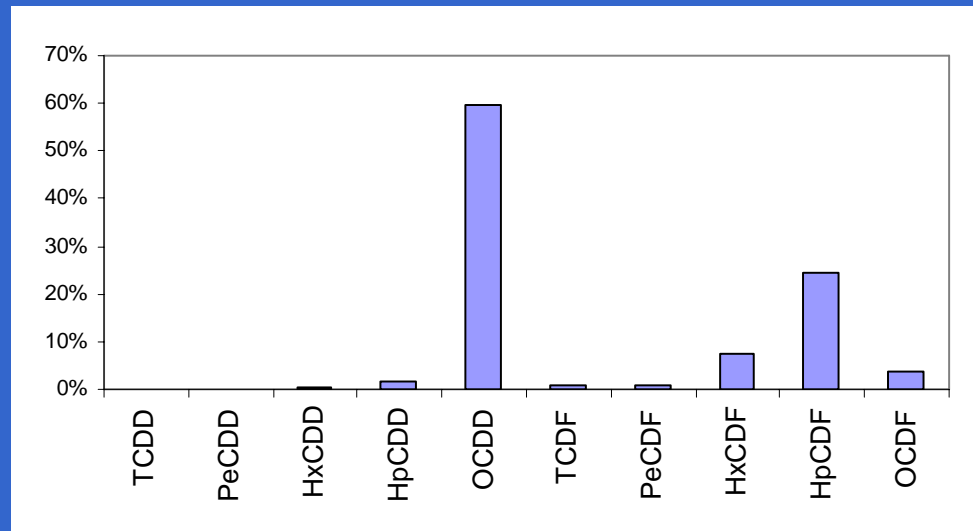


- Consortium for Coordination of Research Activities for the Venice Lagoon System (CORILA)
- M. Frignani, L. Bellucci, S. Giuliani, G. Capodaglio, M. Gerino, A. Gambaro, C. Solidoro
- Prof. G. Arhonditsis

PCDD/F Sources



Sediment Profile 18-21 cm* Segment 6

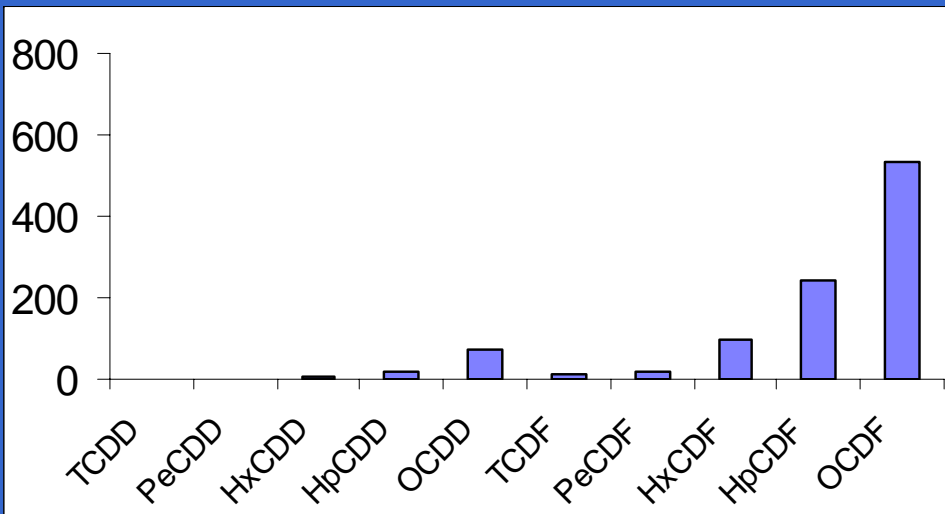


* Frignani et al. 2005, *Environment International*

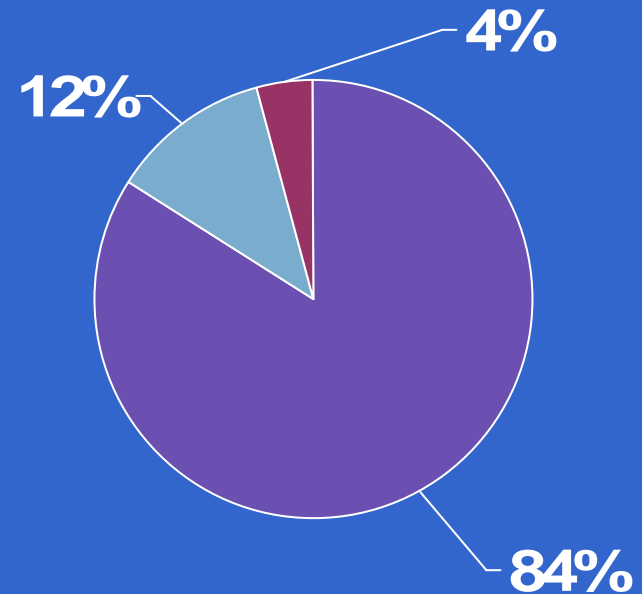
PCDD/F Sources



Porto Marghera Profile 0-5cm* Industrial Channels



OCDF



* Frignani et al. *Marine Pollution Bulletin* 2000