Study of aerosol sources and processing GVAX Pantnagar

Objective: **Anthropogenic triggers for biogenic SOA from multiphase chemistry**
Innovative Radiation measurements to characterize 4D Chemical and Physical state

Climate Relevant SOA Properties Investigated:
Kinetic rates & viscosity & phase effects in aqueous aerosols
4D controls on Oxidant fields → Rates of VOC oxidation → SOA mass and O:C
Multispectral aerosol extinction profiles
Column: AOD, NSD, real & imaginary refractive index

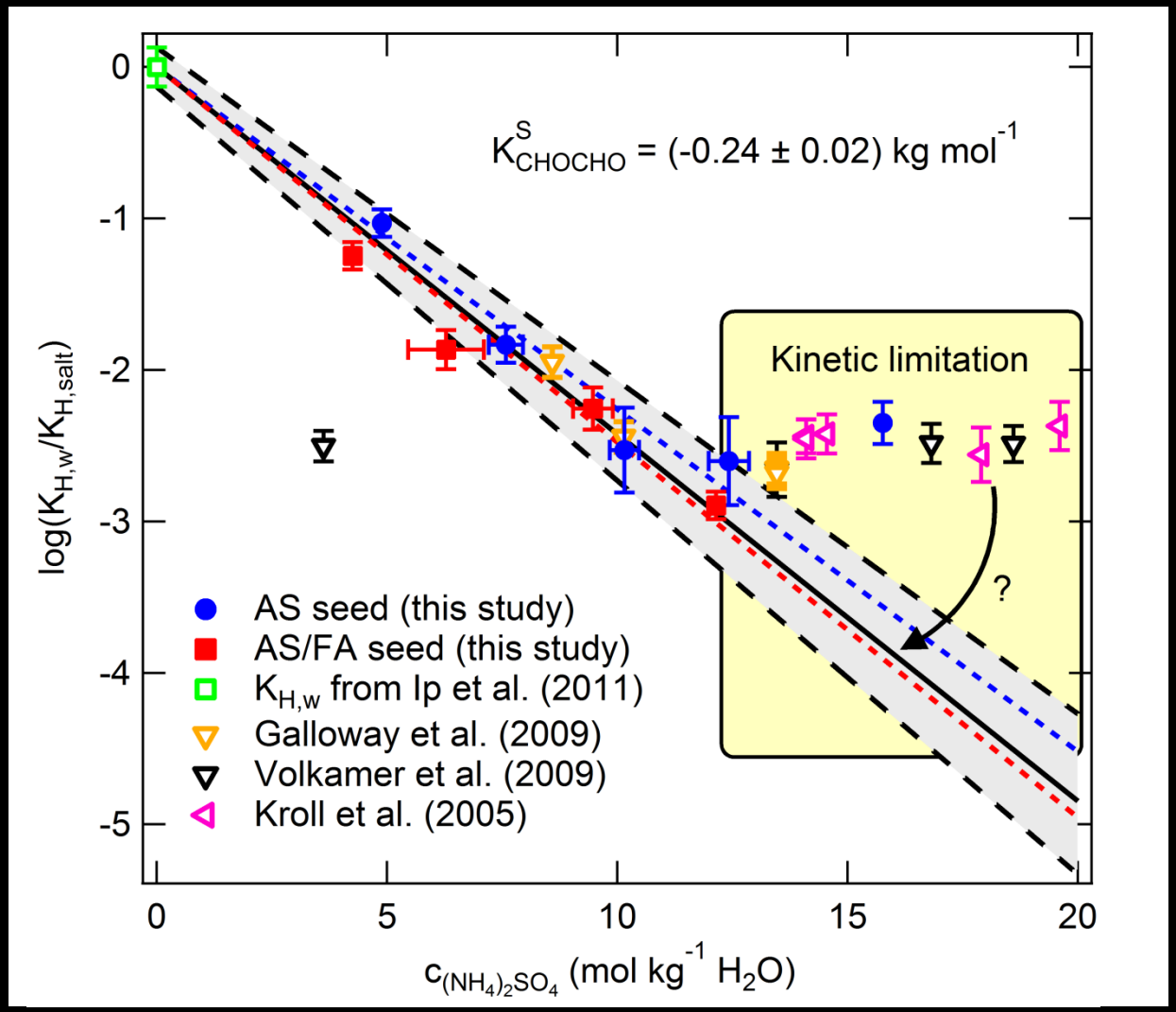
PI: **Rainer Volkamer**
Collaborators: Chamber: PSI team & Hoffmann, Noziere, Yu, Holzinger, Laskin
WRF-Chem: Alma Hodzic, Jose Jimenez
TCAP: Larry Berg & Kassianov, Schmid & G1 team, NOAA & NASA-B200 teams

Progress: **Setschenow salting-constant: exponential increase of Henry's law coefficient**
→ SO_4^{2-} & OA & viscosity effects (Kampf et al., 2013 ES&T)
→ Multiphase chemistry influences macroscopic O/C (Waxman et al., 2013 GRL)
→ WRF-Chem (Knote et al., 2013, ACPD)
Example: OVOC vertical profile comparison with WRF-Chem

Needs: EMSL proposal funded: filter analysis w/ Alex Laskin → ASR proposal
Missing collaborator: liked to put glyoxal salting-in mechanism in a global model

„Salting-in“ triggered by particulate SO_4^{2-}

Setschenow (1889): $$log\left(\frac{K_{H,w}}{K_{H,salt}}\right) = K^S{}_i \quad = (-0.24 \pm 0.02) \times c_{AS}$$



Independent from organic seed constituents and radiative conditions

Deviation from expected behavior above c_{AS} = 12 M

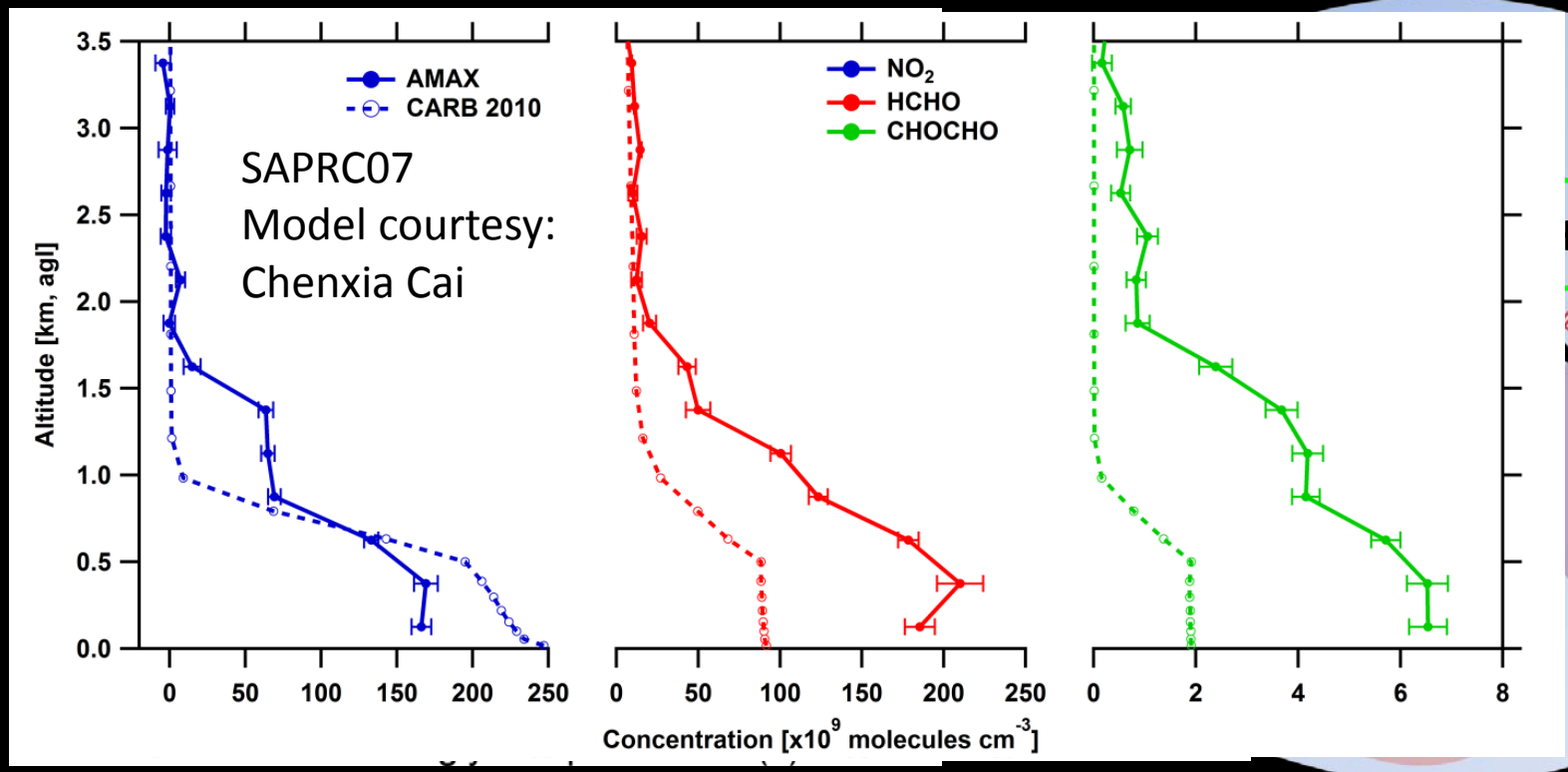
-> Phase separation?

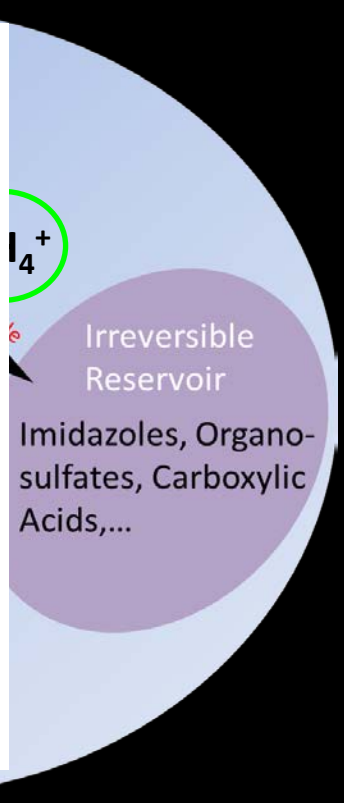
-> Viscosity?

$$K_{H,salt} = K_H \times 10^{-K_i^S c_{salt}}$$

Kampf et al., 2013, ES&T

„Salting-in“ triggered by particulate SO_4^{2-}





TCAP: US wide hotspot for glyoxal multiphase chemistry (lower limit?)

CARES: SOA potential is inhibited by high viscosity

Fundamental relevance of H for reactive uptake:

$$\frac{1}{\gamma} = \frac{1}{\gamma_{\text{diff}}} + \frac{1}{\alpha} + \frac{1}{\gamma_{\text{sat}} + \gamma_{\text{rxn}}} \approx \frac{1}{\alpha} + \frac{\langle c \rangle}{4HRT\sqrt{kD_a}}$$

Kampf et al., 2013, ES&T
Waxman et al., 2013, GRL