

# Aerosol acidity and phase partitioning of nitric acid in the marine boundary layer

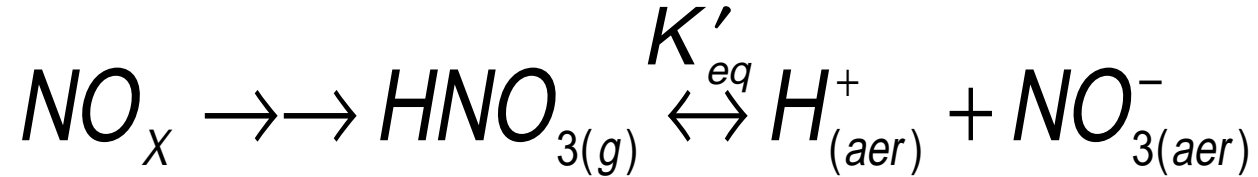
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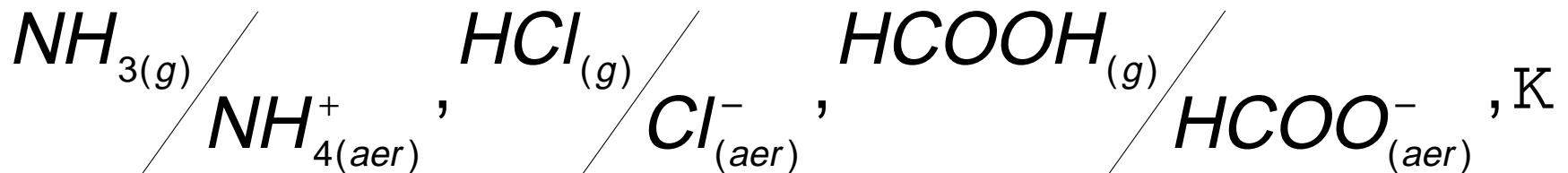
- Nitrogen oxides ( $\text{NO}_x = \text{NO} + \text{NO}_2$ ) exert significant control over ozone production/destruction; nitric acid ( $\text{HNO}_3$ ) is the final end product of  $\text{NO}_x$  chemistry
- $\text{HNO}_3$  is removed from the MBL by direct deposition to the ocean surface and by partitioning into aerosols and the subsequent dry deposition or rainout/washout of the aerosols

Example:



$$K'_{eq} = \frac{[H^+_{(aer)}] \times [NO^-_{3(aer)}]}{[HNO_{3(g)}]}$$

$$[H^+_{(aer)}] = \frac{K'_{eq} \times [HNO_{3(g)}]}{[NO^-_{3(aer)}]}$$



# MOCCA

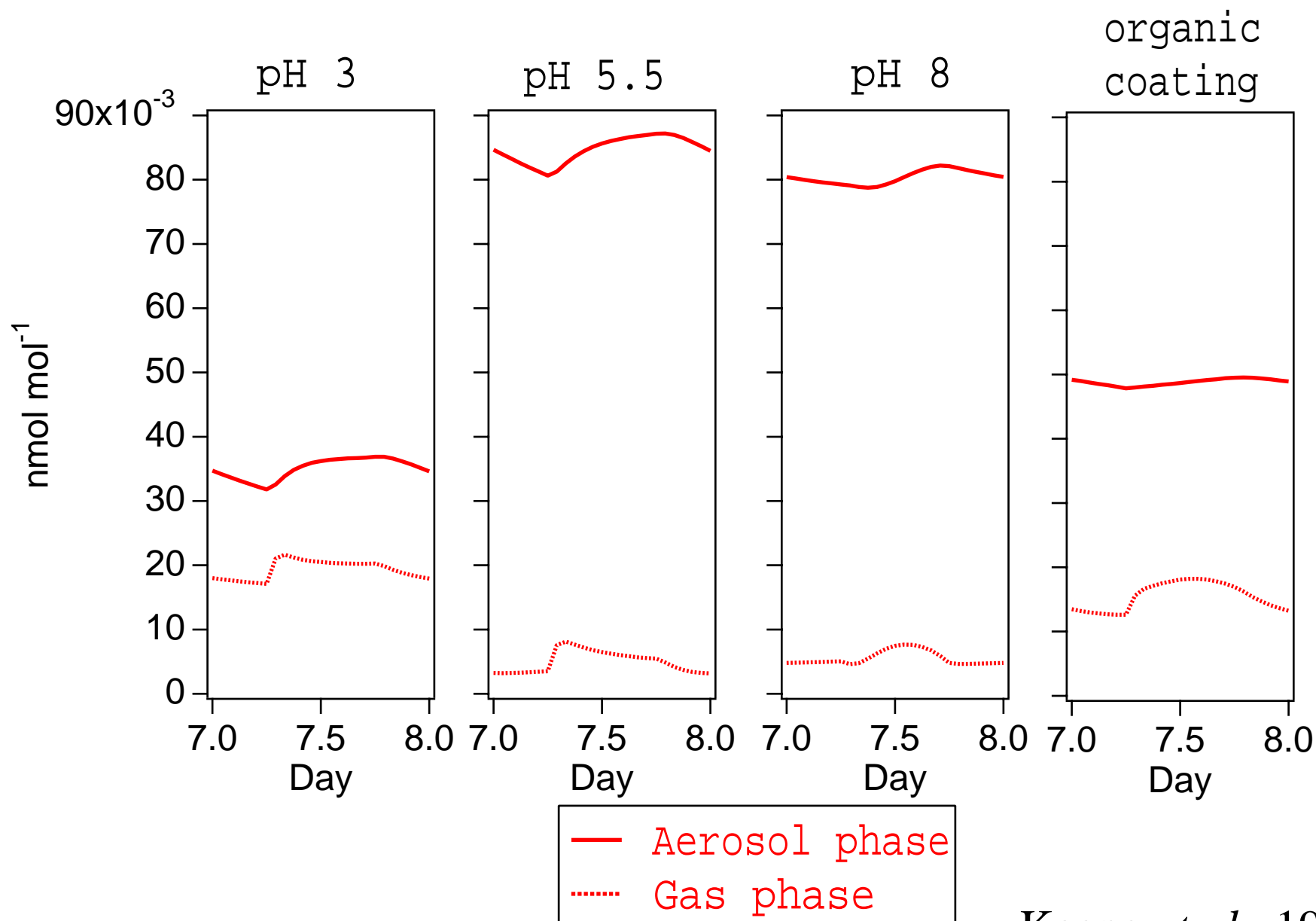
## Model of Chemistry Considering Aerosols

(Sander and Crutzen, 1996; Vogt *et al.*, 1996)

- Photochemical box model
- Detailed chemical algorithm
  - Halogen radical chemistry
  - Scavenging
  - Aqueous transformations
  - S(IV) oxidation
  - Volatilization of products
- 1 seasalt size bin; 1 S-aerosol size bin

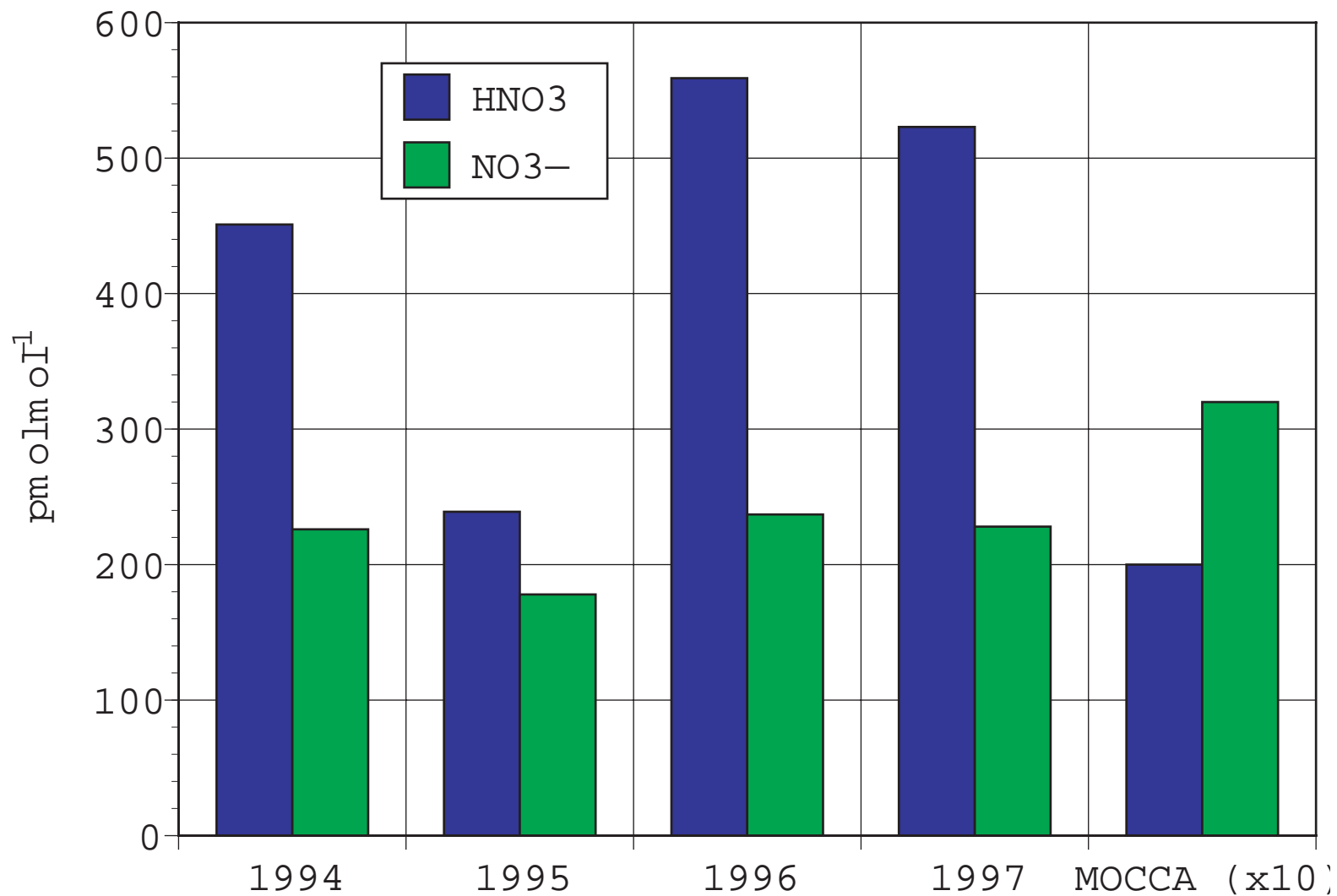


# HNO<sub>3</sub> Phase Partitioning (MOCCA)



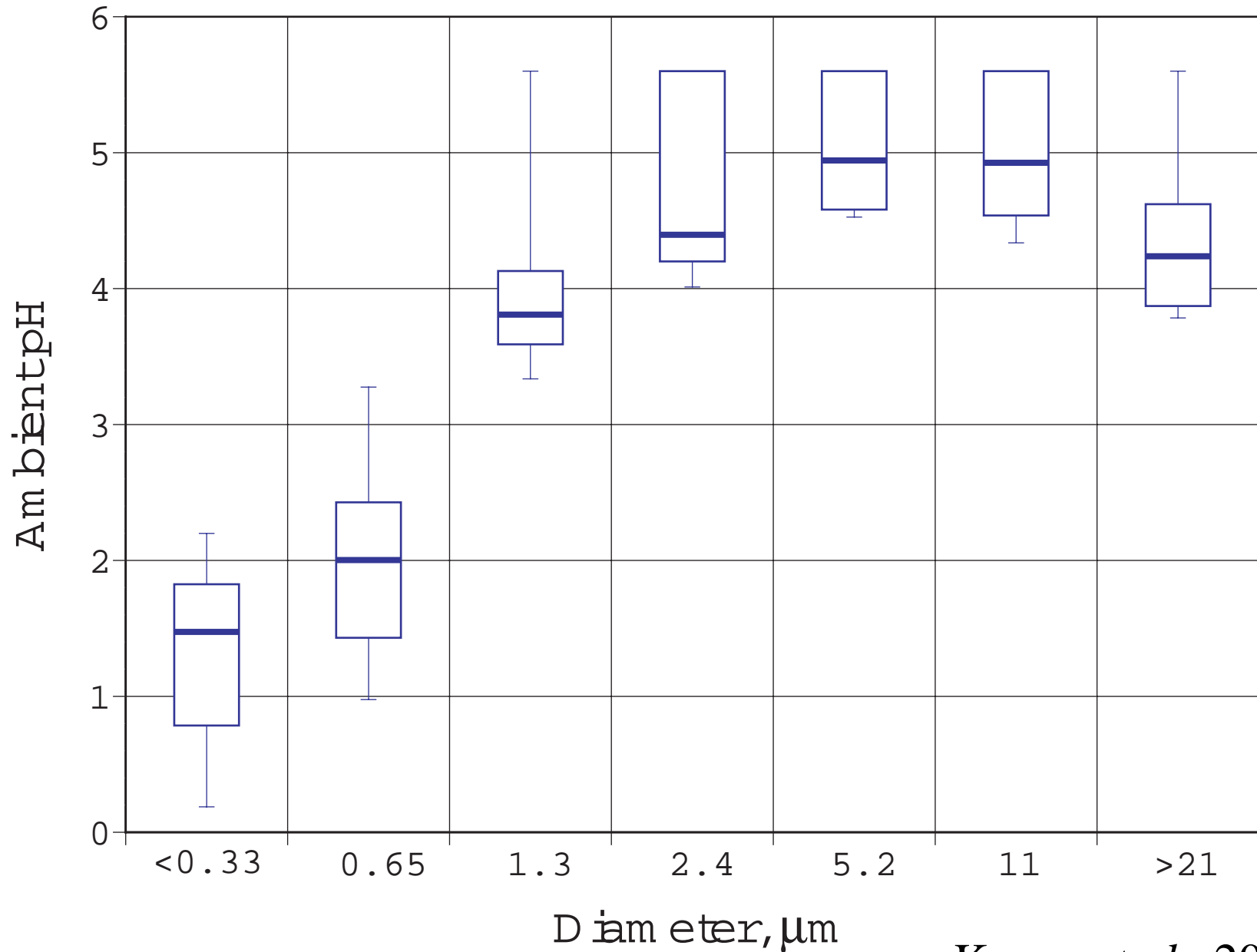
Keene *et al.*, 1998

# Summer $\text{HNO}_3$ and $\text{NO}_3^-$ at New Castle



Jordan & Talbot, 2000

# Aerosol pH at Bermuda (May, 1997)



Keene *et al.*, 2001

# Measurements

- Mist chamber measurements of gas phase concentrations of  $\text{HNO}_3$  ( $12 \text{ hr}^{-1}$ ) and  $\text{HCl}$ ,  $\text{HCOOH}$ ,  $\text{CH}_3\text{COOH}$ ,  $\text{NH}_3$  &  $\text{SO}_2$  ( $\sim 1 \text{ hr}^{-1}$ )
- Cascade impactor measurements of aerosol concentrations of  $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{HCOO}^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{CH}_3\text{SO}_3^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$  &  $\text{Ca}^{2+}$ ) in 7 size ranges from  $<0.5$  to  $>20 \mu\text{m}$  ( $4 \text{ day}^{-1}$ )
- Aerosol pH (Keene *et al.* almost-in-press, GRL)
- Precipitation chemistry? Fog chemistry?