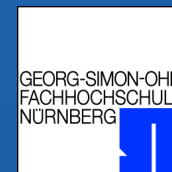


# Biofiltration of cyanobacterial metabolites MIB and geosmin as a viable water treatment option

Daniel Hoefel, Lionel Ho, Bridget McDowall, Paul Monis,  
Gayle Newcombe and Christopher Saint

*National Cyanobacterial Workshop,  
Parramatta, 12<sup>th</sup> to 13<sup>th</sup> August, 2009*

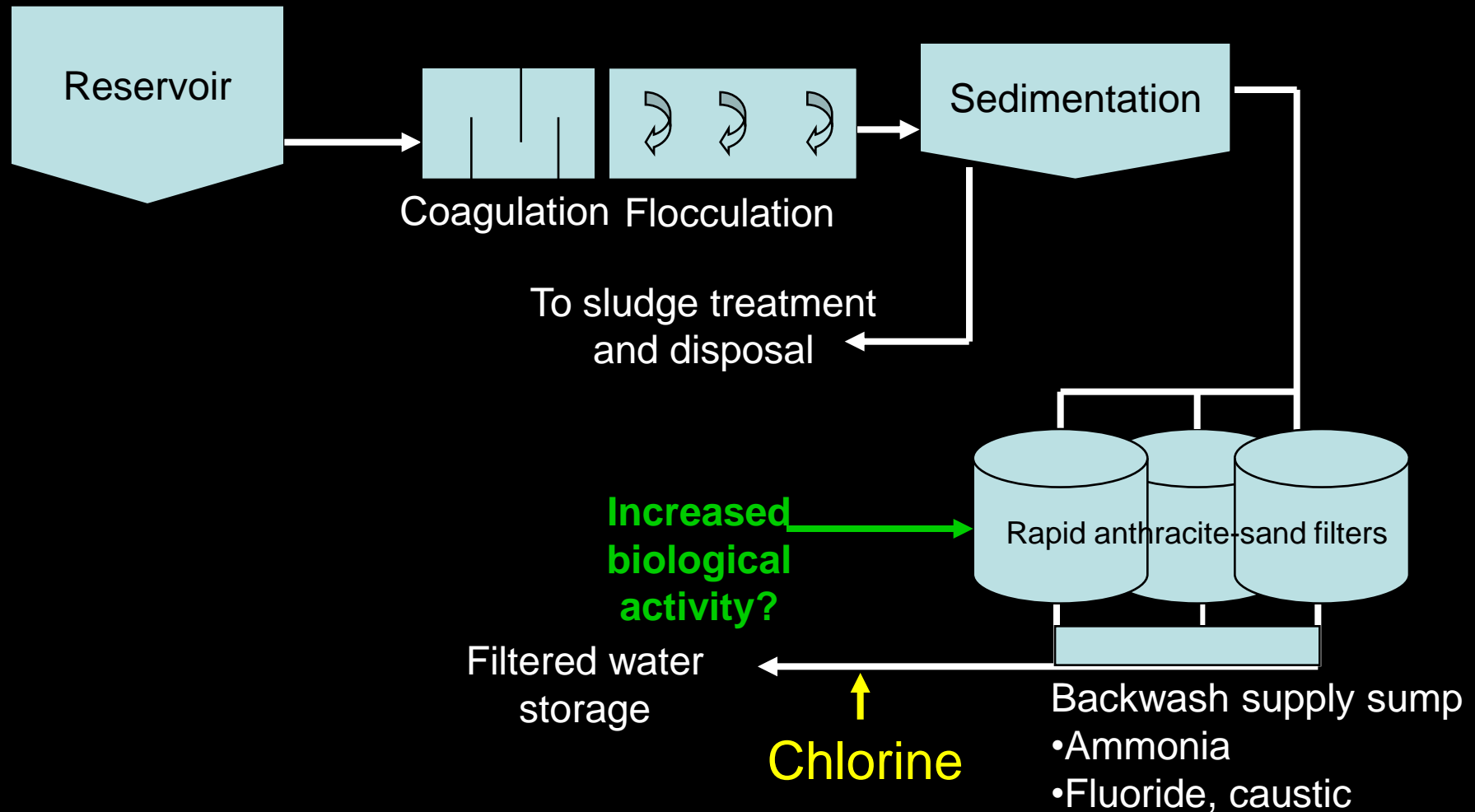




Government  
of South Australia



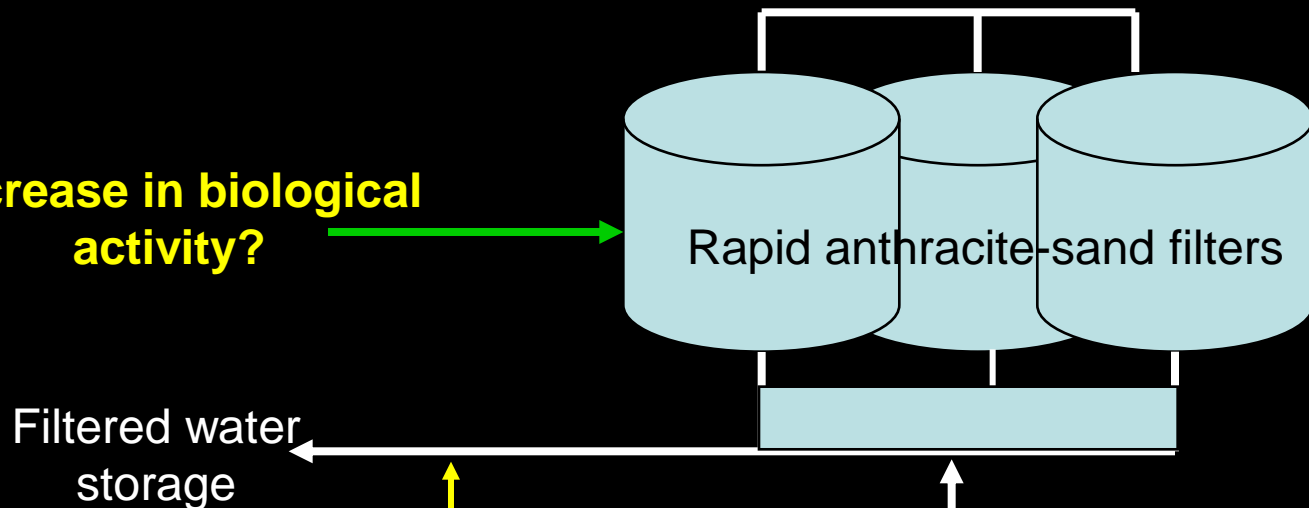
# Biological filtration in SA WTPs



# Biological filtration at Morgan WTP

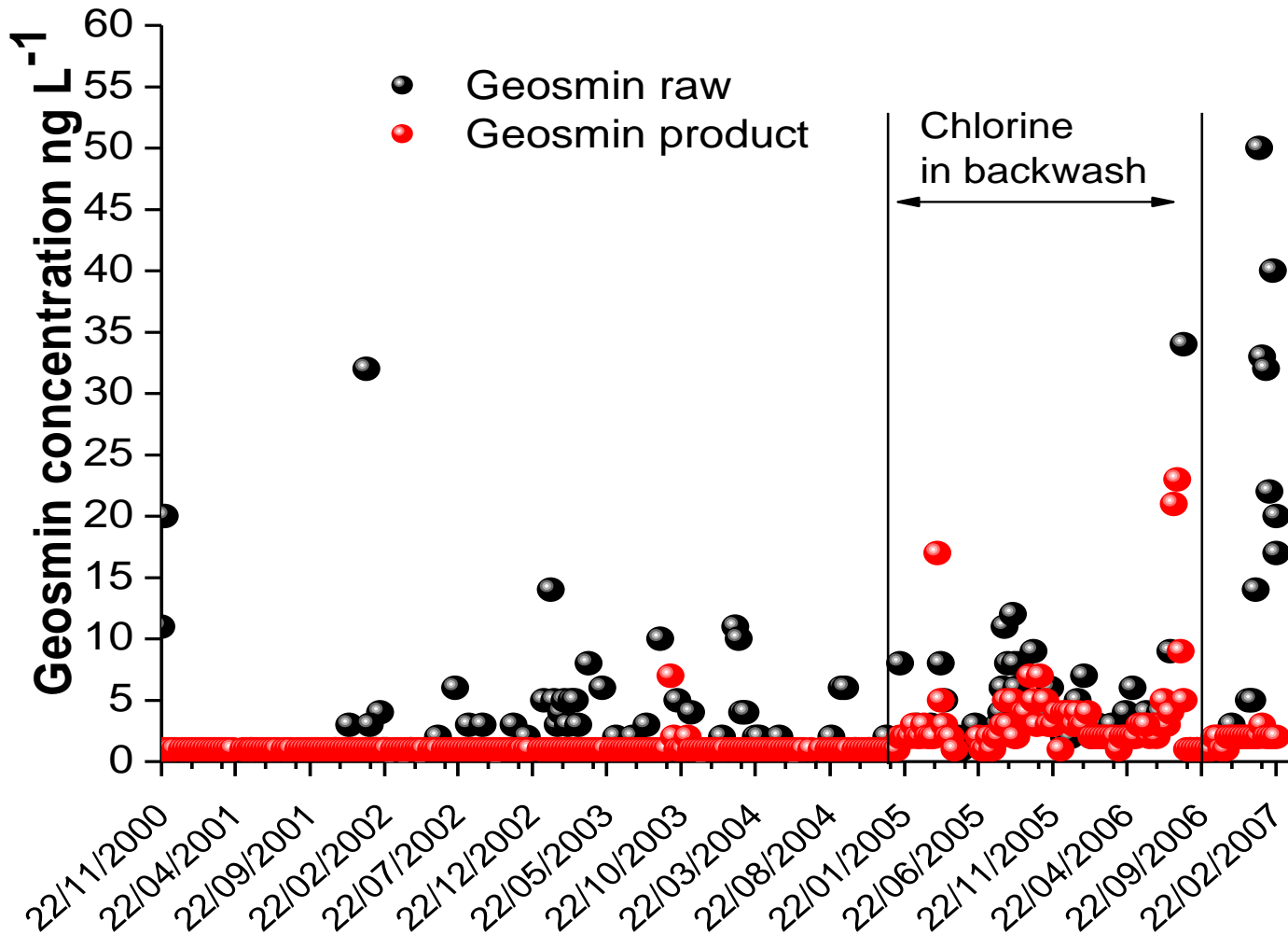
- Filter media in place since 1986
- December 2004

Decrease in biological activity?



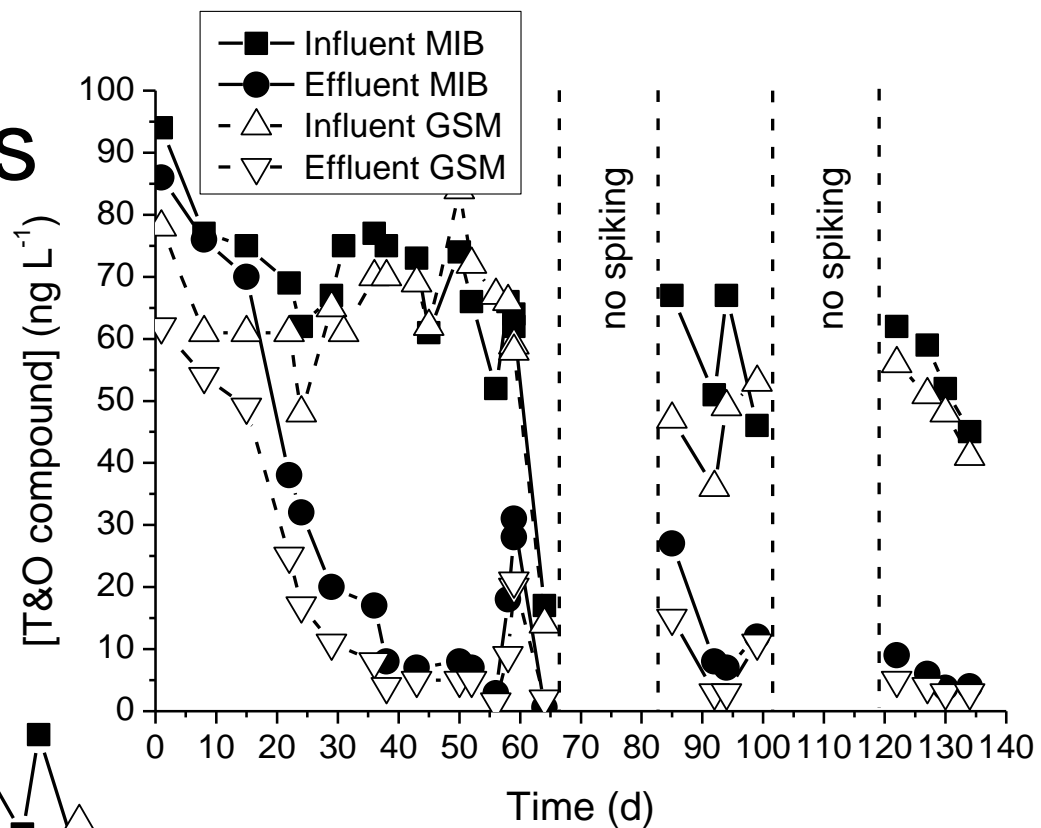
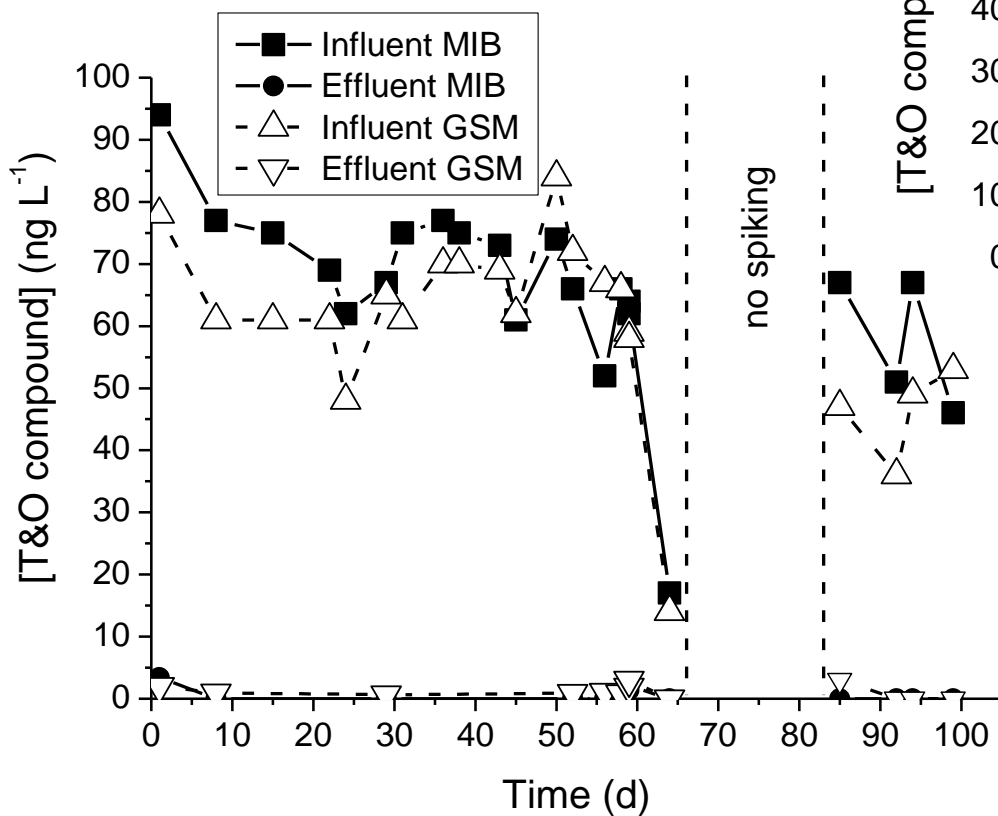
**Geosmin Breakthrough**

# Geosmin breakthrough



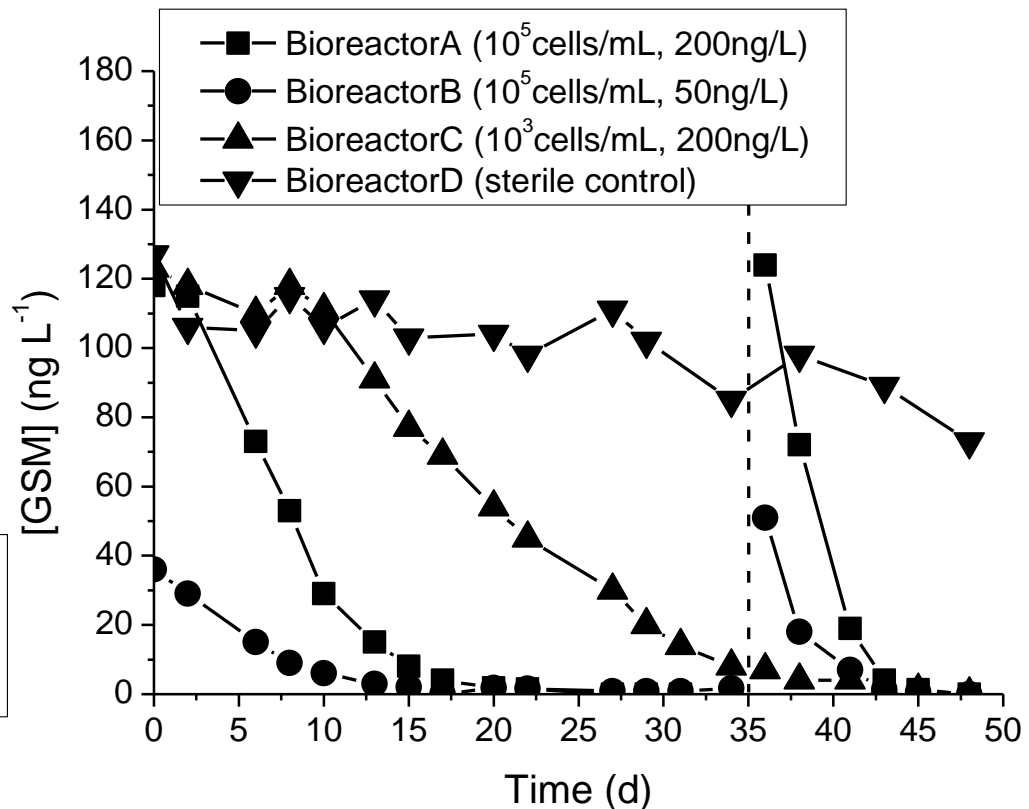
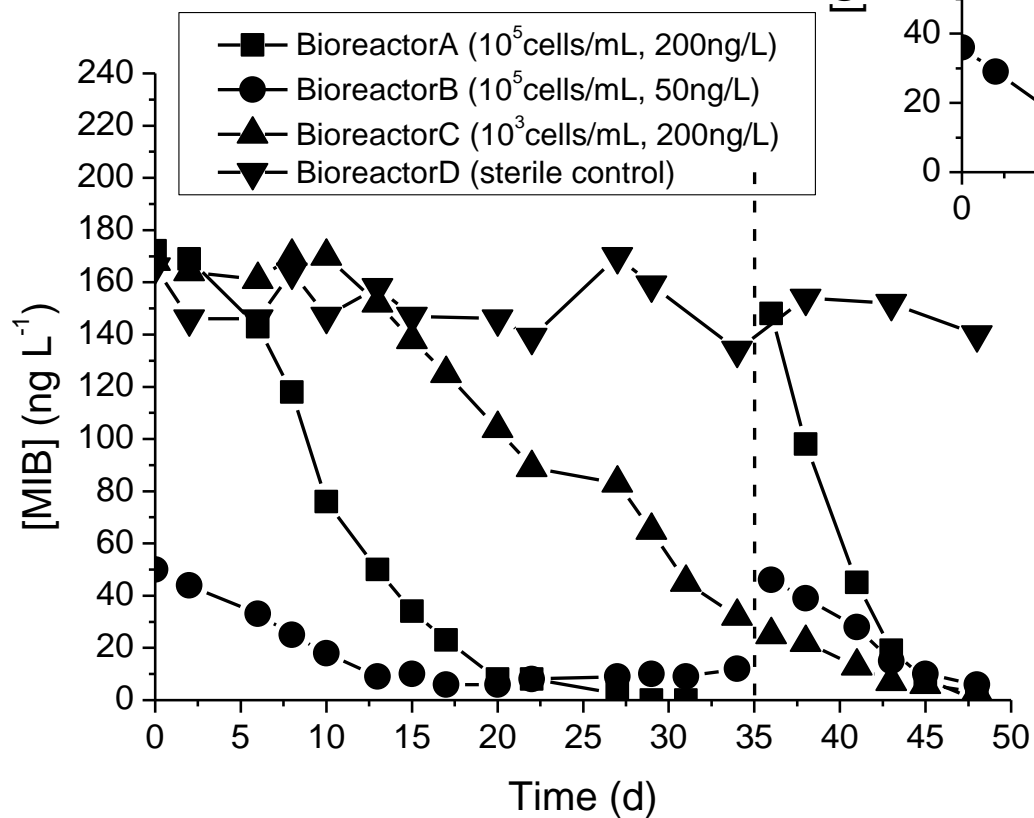
# Laboratory scale column experiments

(Morgan WTP sand filter medium)



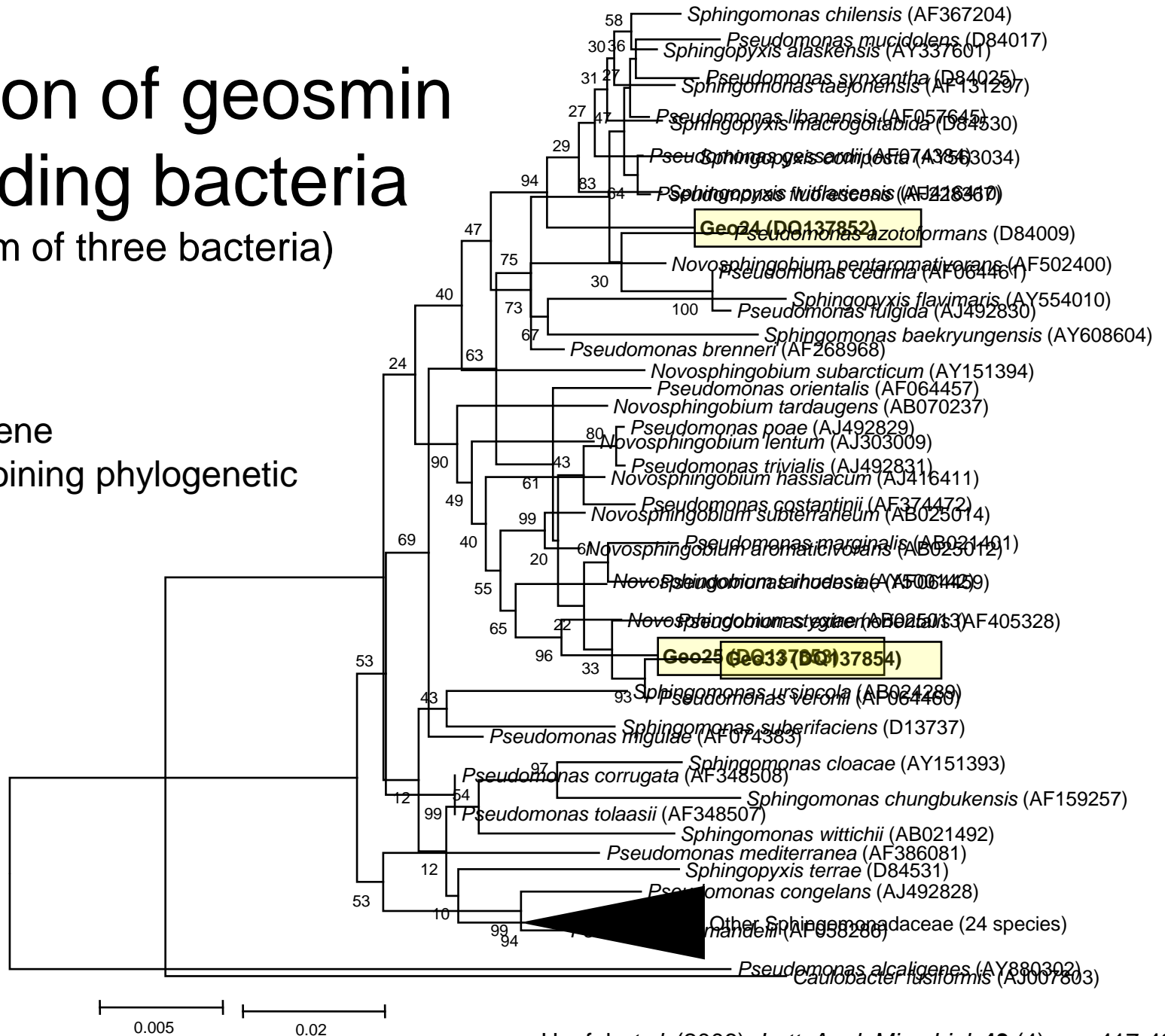
# Batch experiments

(Morgan WTP settled water)



# Isolation of geosmin degrading bacteria (consortium of three bacteria)

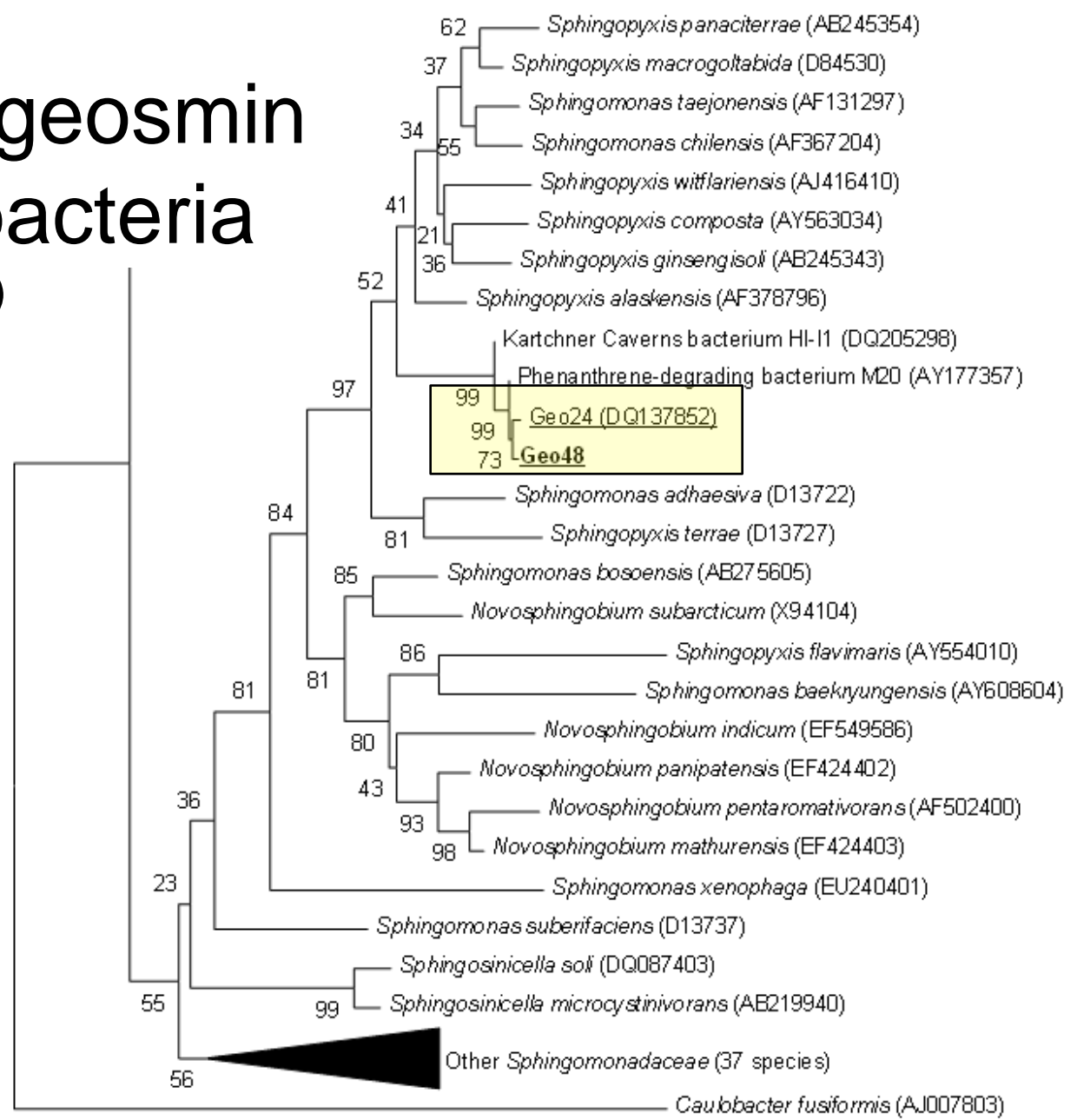
16S rRNA gene  
Neighbour-joining phylogenetic analysis



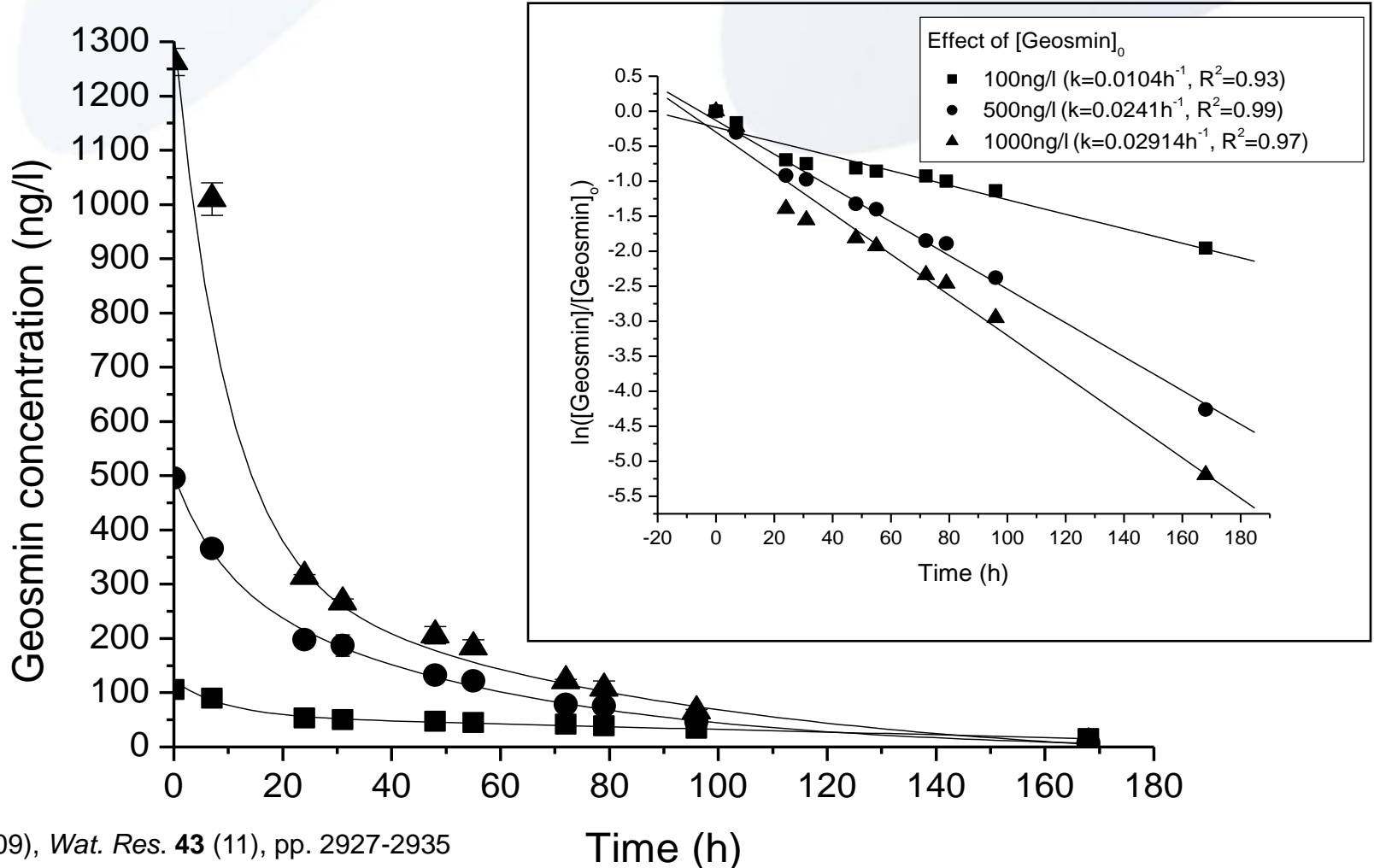
# Isolation of geosmin degrading bacteria

(individual bacterium)

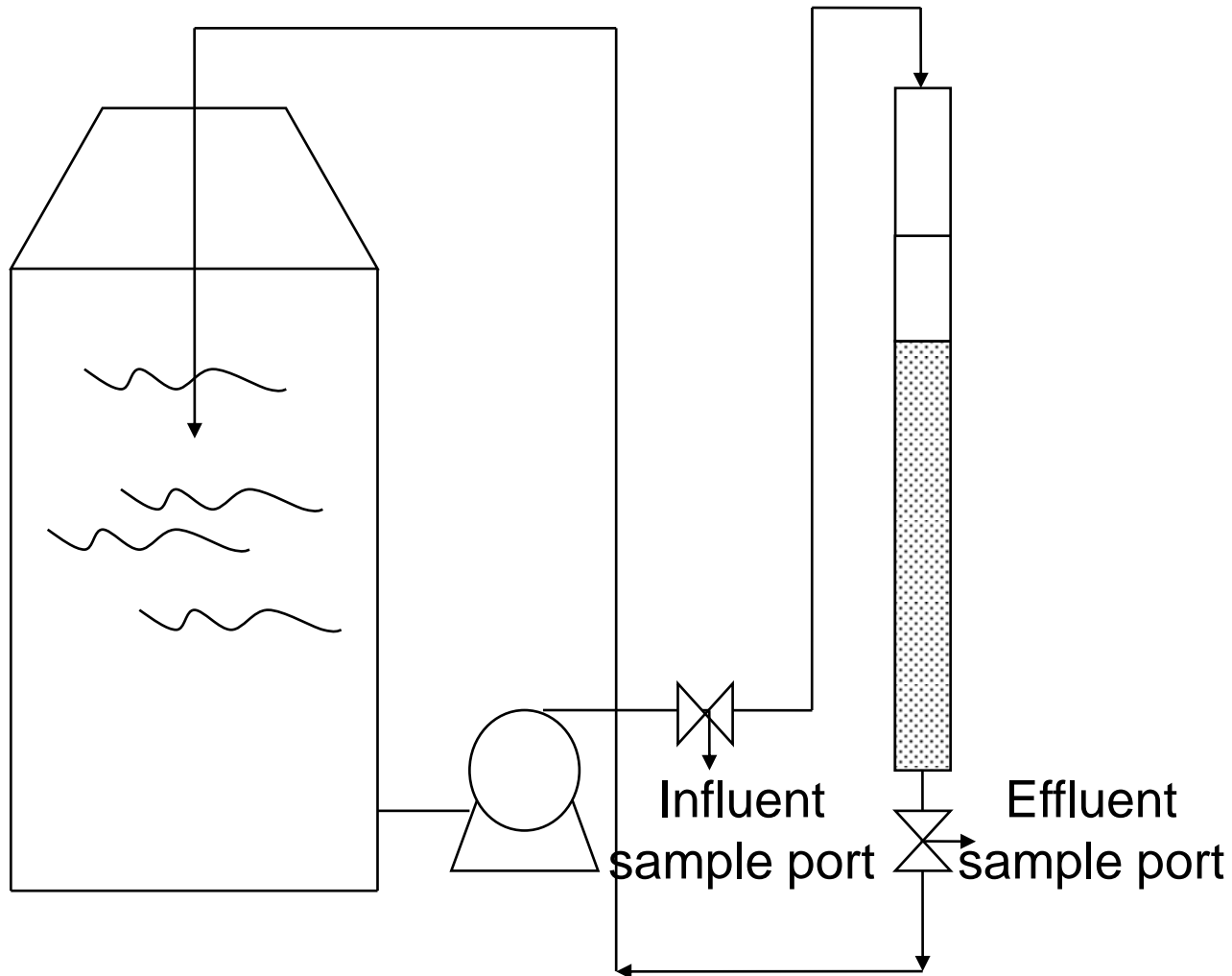
16S rRNA gene  
Neighbour-joining  
phylogenetic  
analysis



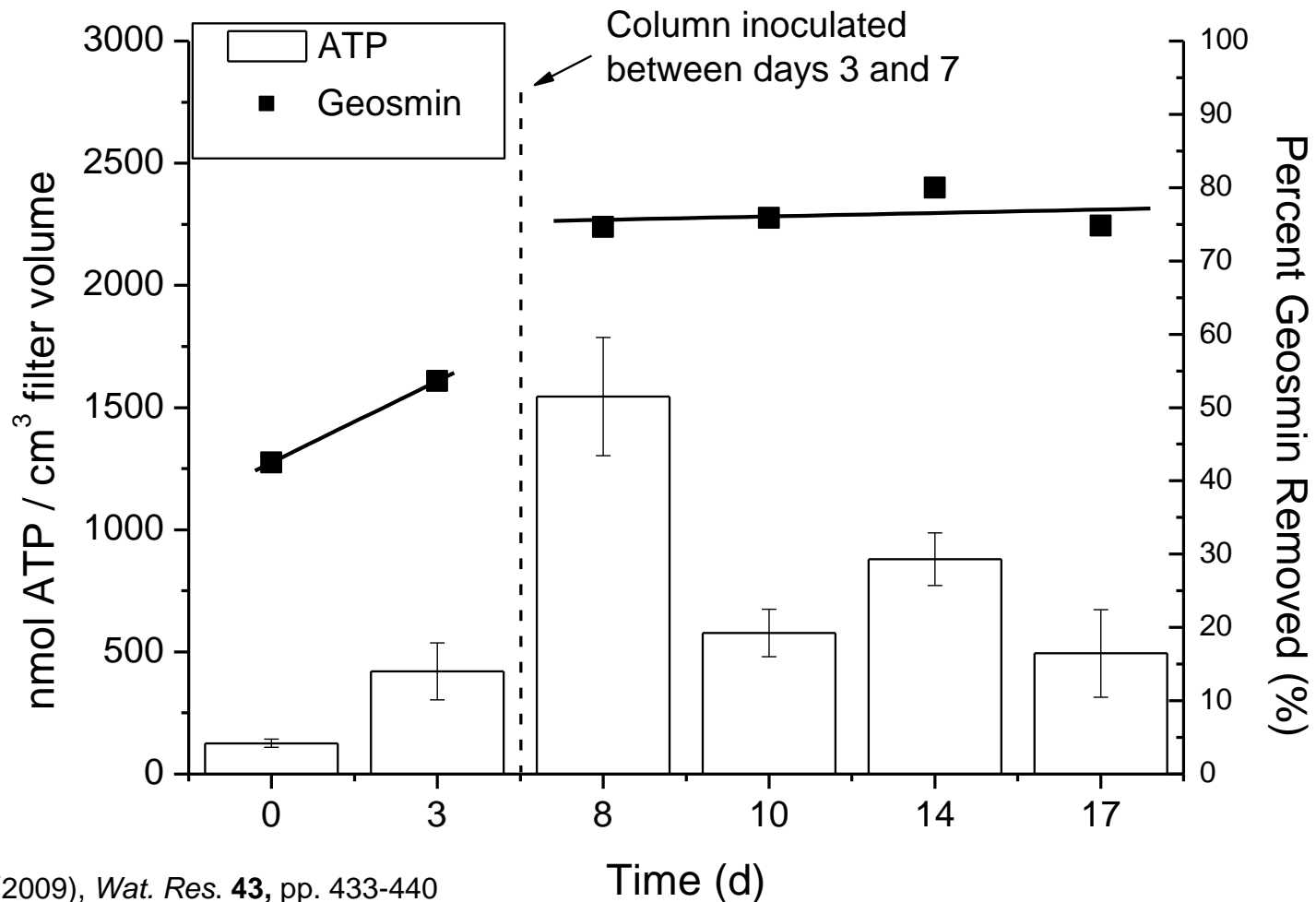
# Geosmin degradation by individual bacterium *Sphingopyxis* sp. Geo48



# Enhancing biofiltration of geosmin by seeding sand filters with geosmin degrading bacteria



# Enhancing biofiltration of geosmin by seeding sand filters with geosmin degrading bacteria



# Conclusions

- ◆ Chlorine in backwash water of Morgan WTP
  - Full scale evidence of biofiltration for the removal of secondary algal metabolites (T&O compounds)
  
- ◆ Laboratory scale column and batch experiments
  - Validated the full scale removals at Morgan WTP
  - Investigate transient periods for MIB and geosmin
  - Investigated the effect of T&O concentration, cell numbers etc
  
- ◆ Isolation and phylogenetic analysis of geosmin degrading bacteria
  - Better understanding of the organisms responsible for T&O removal
  
- ◆ Enhancing the biofiltration of T&O compounds by seeding sand filter columns

# Future work

- ◆ Isolation of bacteria involved in the degradation of MIB
- ◆ Investigation into the genes involved in the degradation of geosmin and MIB
  - Development of molecular tools for screening WTP sand filters
- ◆ Additional laboratory scale investigations into enhancing biofiltration of geosmin and MIB by seeding degrading organisms
  - Pilot scale

# Acknowledgements

