

Spices in Puget Sound and in Seattle's Sewage Effluent



Rick Keil and Jaqui Neibauer

with thanks to

Kimberly Genter, Britta Voss, Jon Nuwer,
Kelsey McDuffee, Brittany Kimball, Liana Singh
UW School of Oceanography

and

Rick Hammond & Randy Shuman - King County

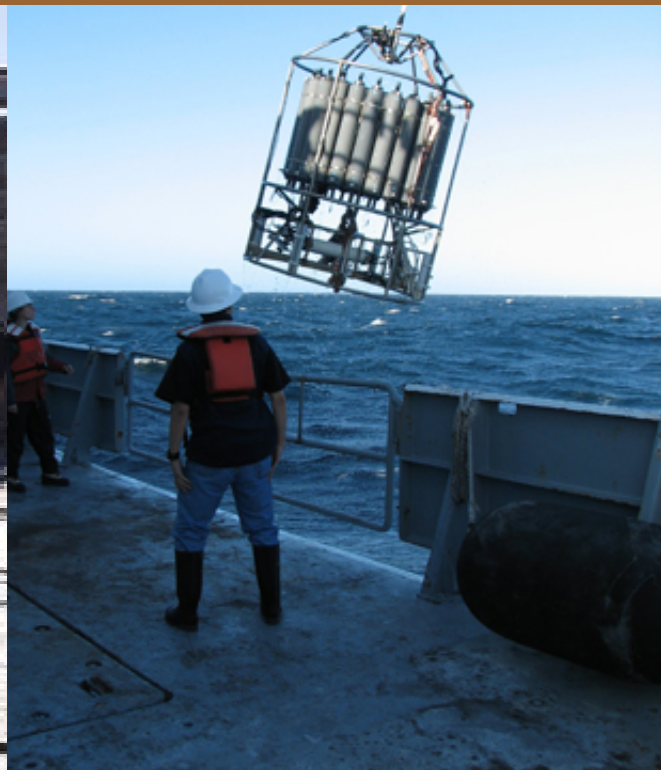


The “take-home message”

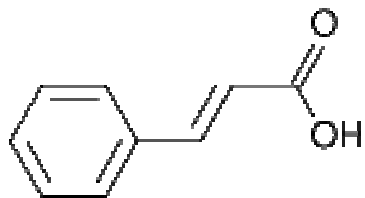
- Your kitchen is connected with Puget Sound
 - PS ‘sees’ seasonal inputs of specific spices
 - What you eat, so does the microbial life of Puget Sound
 - Vanilla:Cinnamon ratio changes seasonally (we eat more cinnamon during the holidays, vanilla is in everything)
 - eVanillin:Vanillin ratio also changes depending on how and when we bake
-
- Note: this research has not yet been published



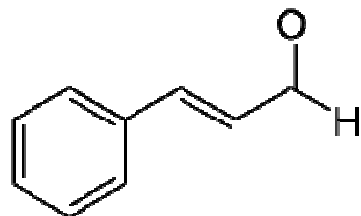
Student interests got us started



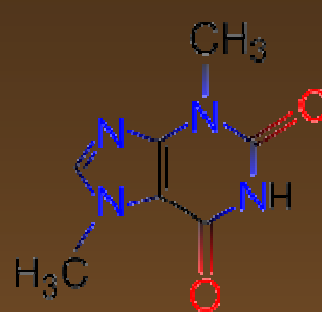
Some spices we measure



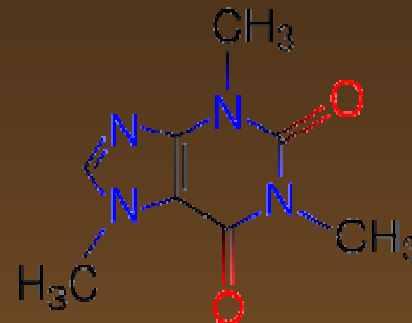
Cinnamic acid



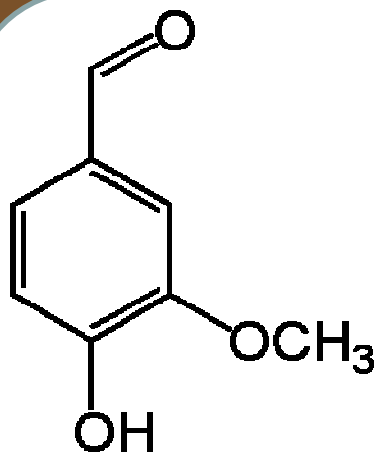
Cinnamaldehyde



Theobromine

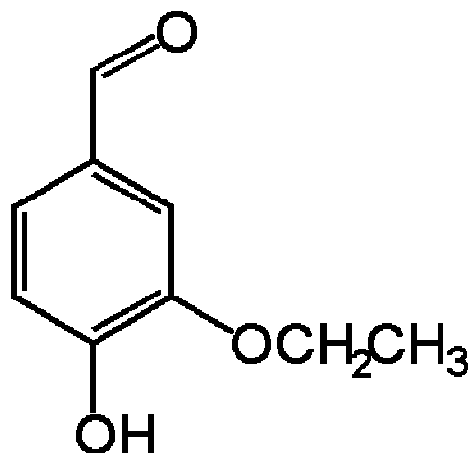


Caffeine

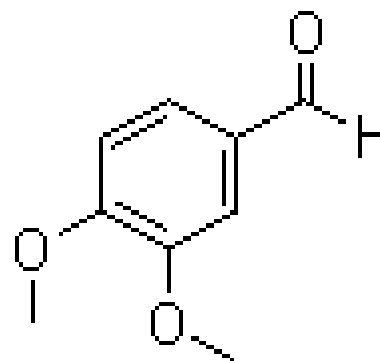


Vanillin

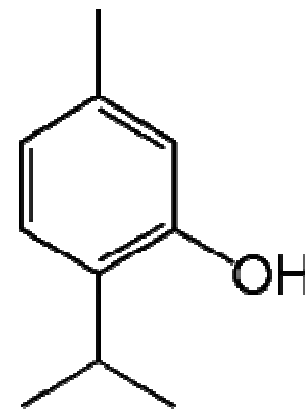
(3-ethoxy-4-hydroxy-benzaldehyde)



ethyl-vanillin



Veratraldehyde



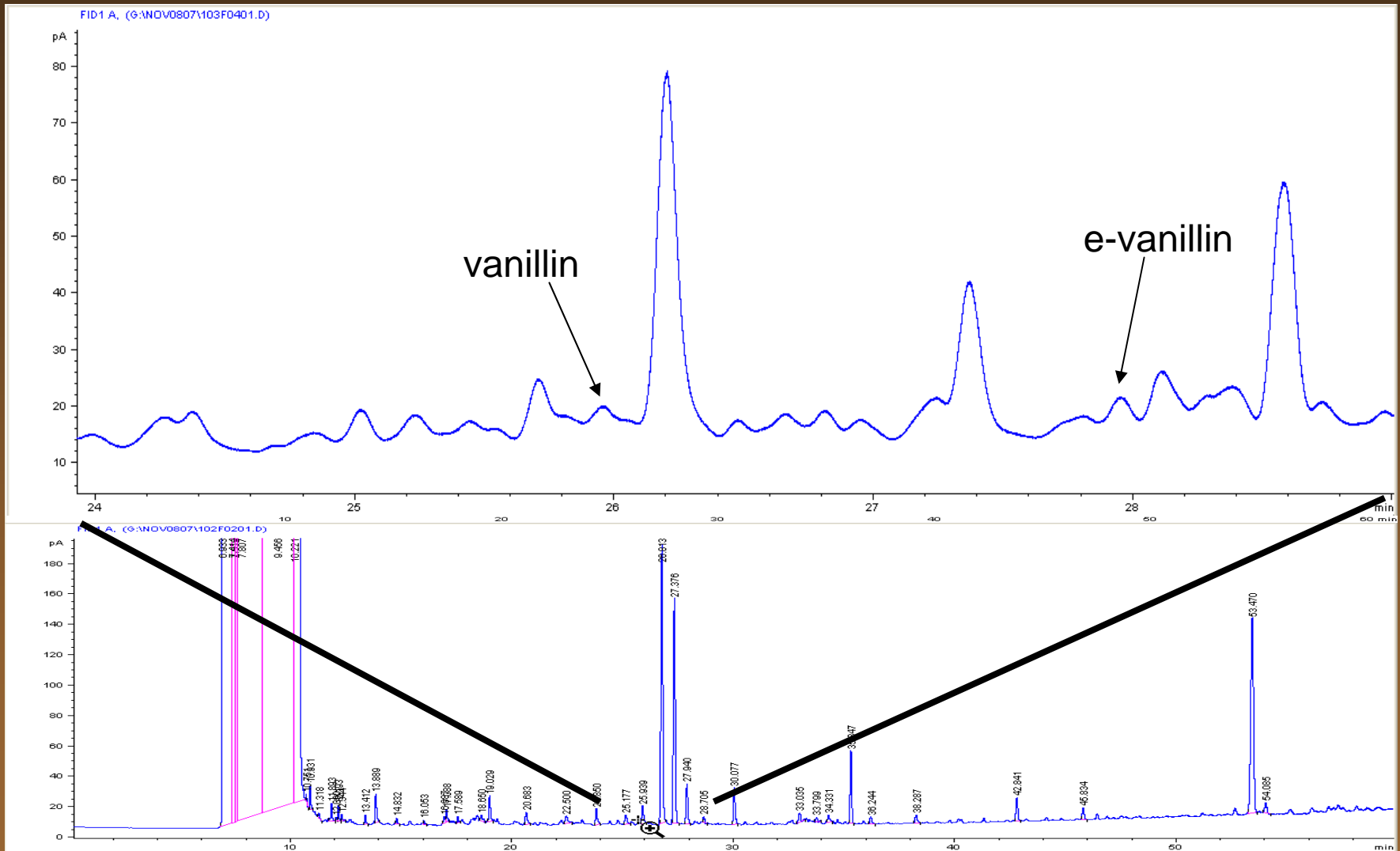
Thymol

How we measure spices

- Many are just lignin phenols in their monomer configuration

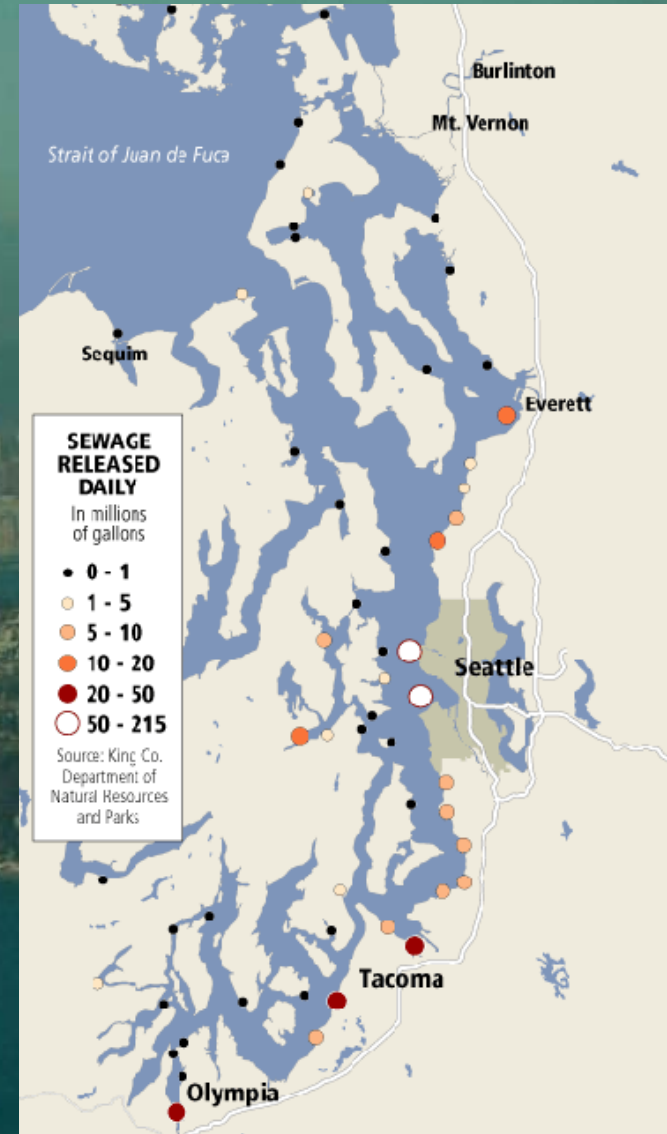


Chromatographs look like this

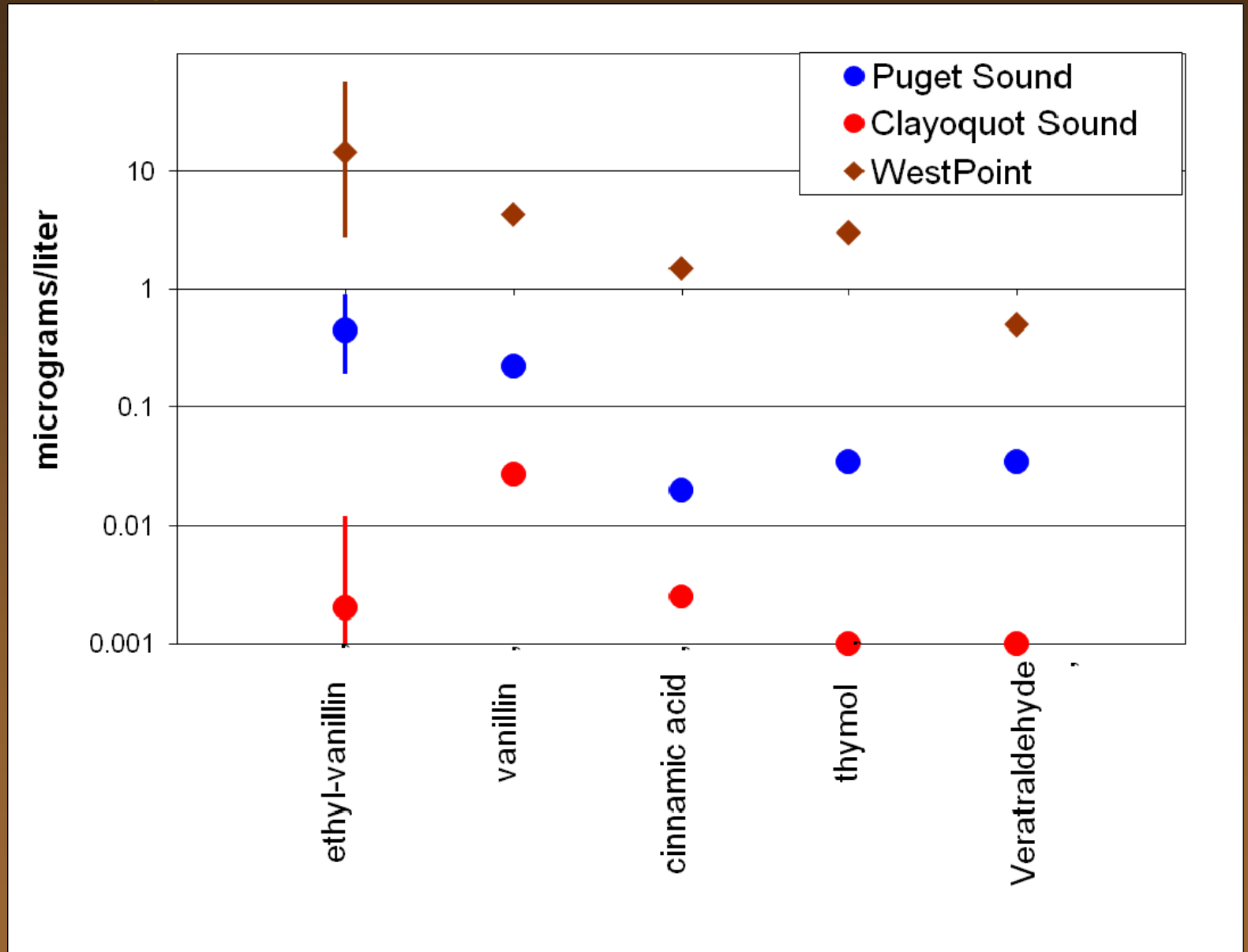


Sampling: Sink to Sound

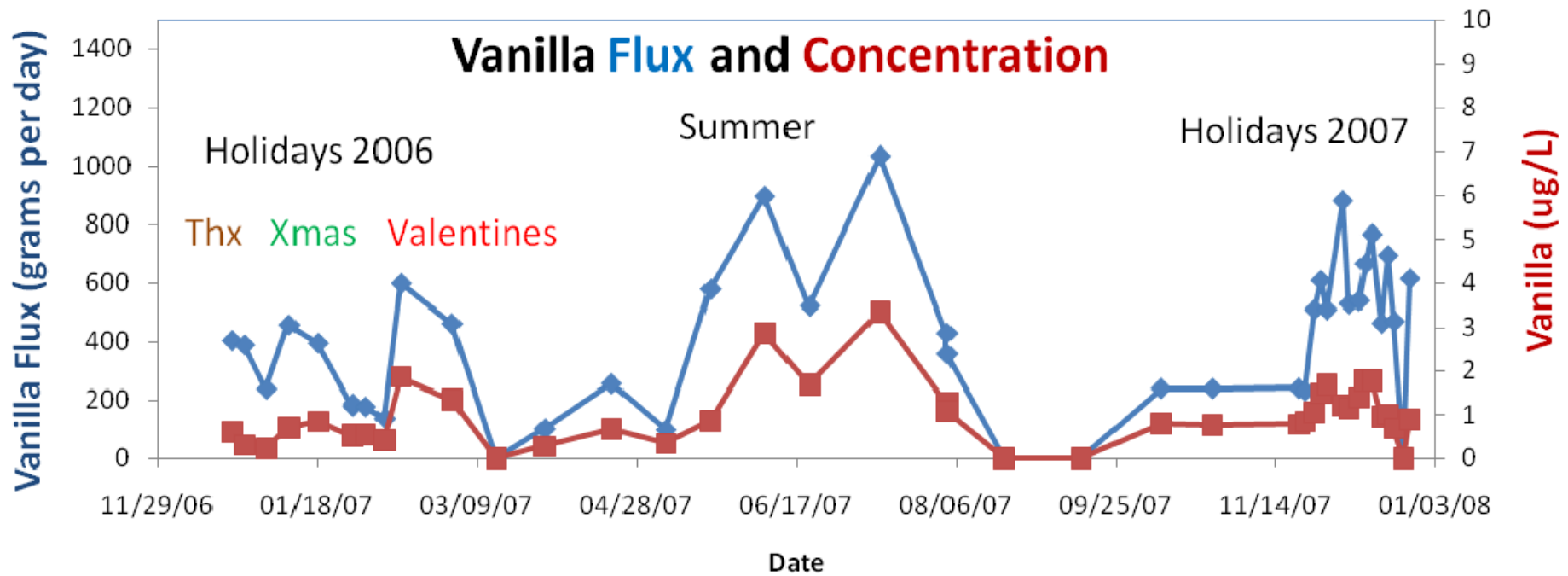
- Westpoint treatment plant
- Puget Sound
- Other marine locations
- Rivers and streams



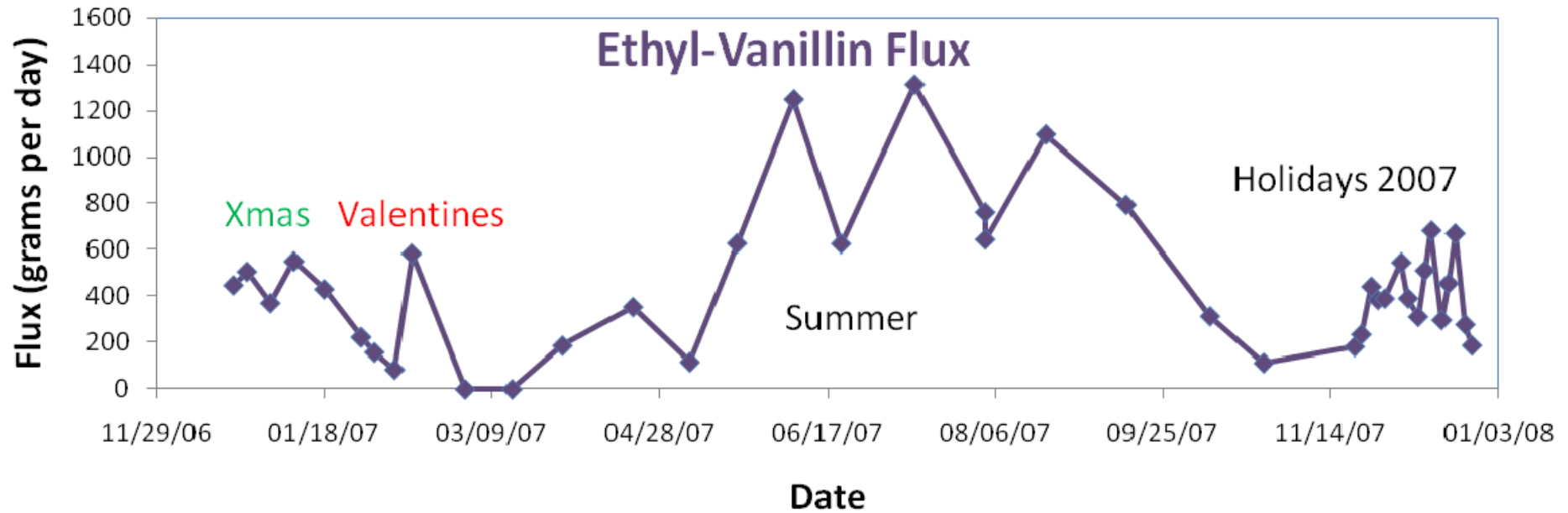
Average Concentrations in Marine Waters



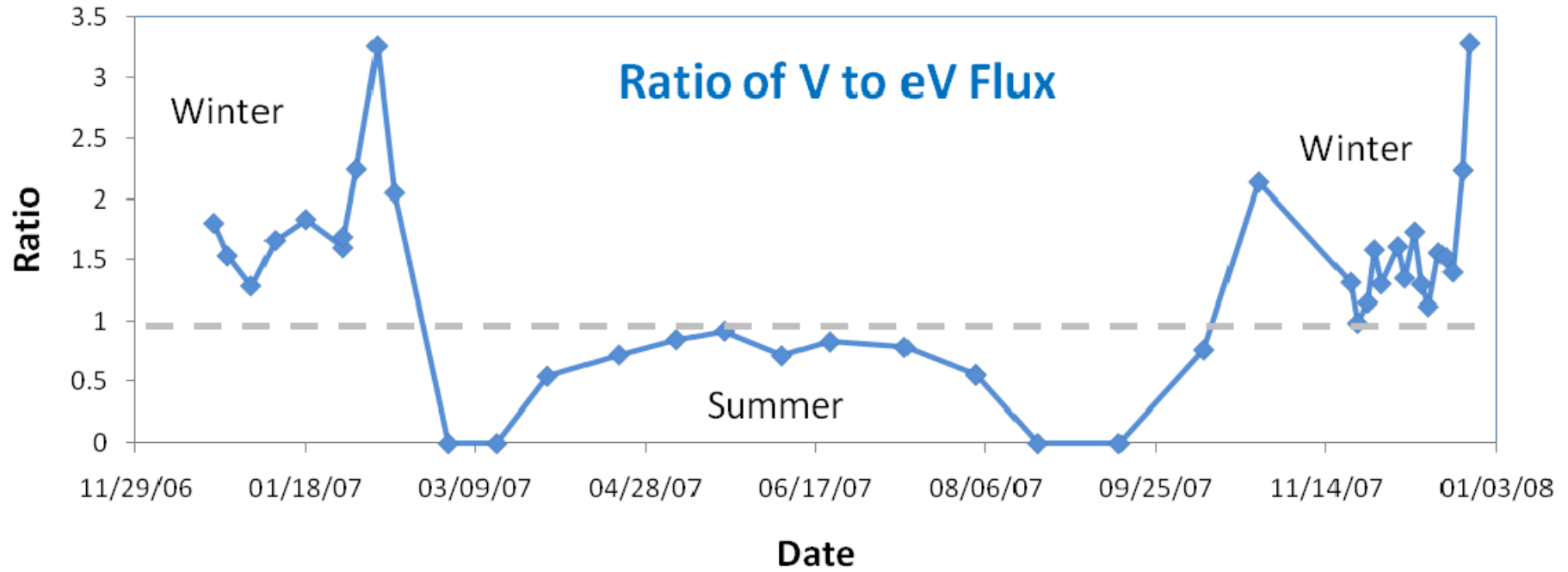
Data: temporal trends in Flux



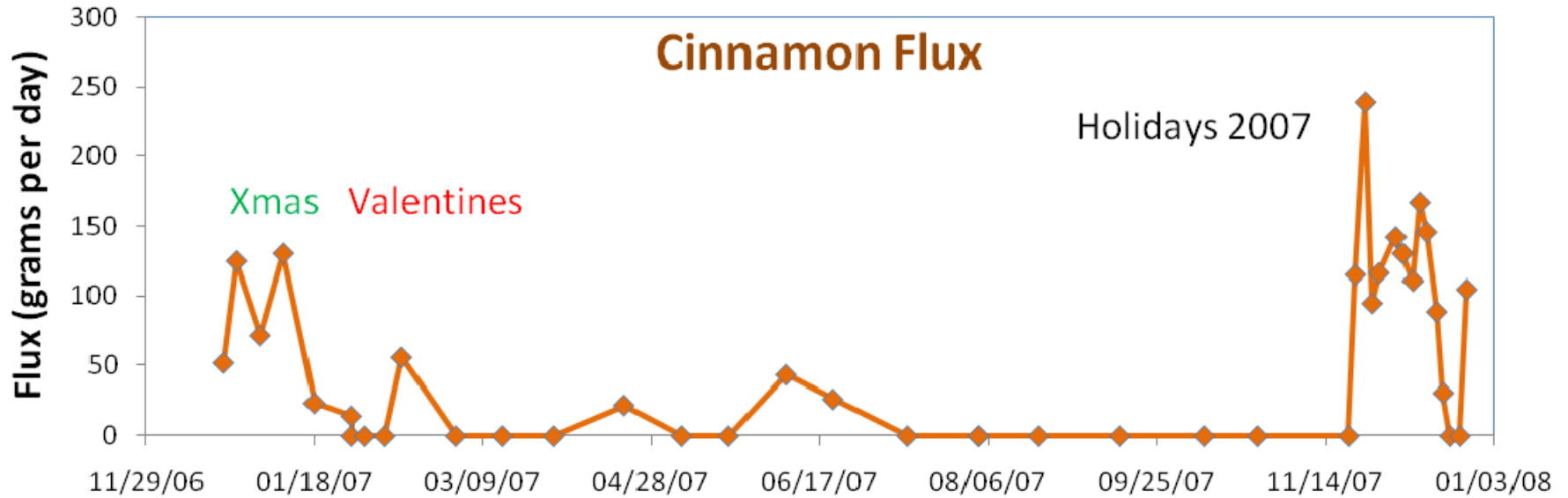
Ethyl-Vanillin



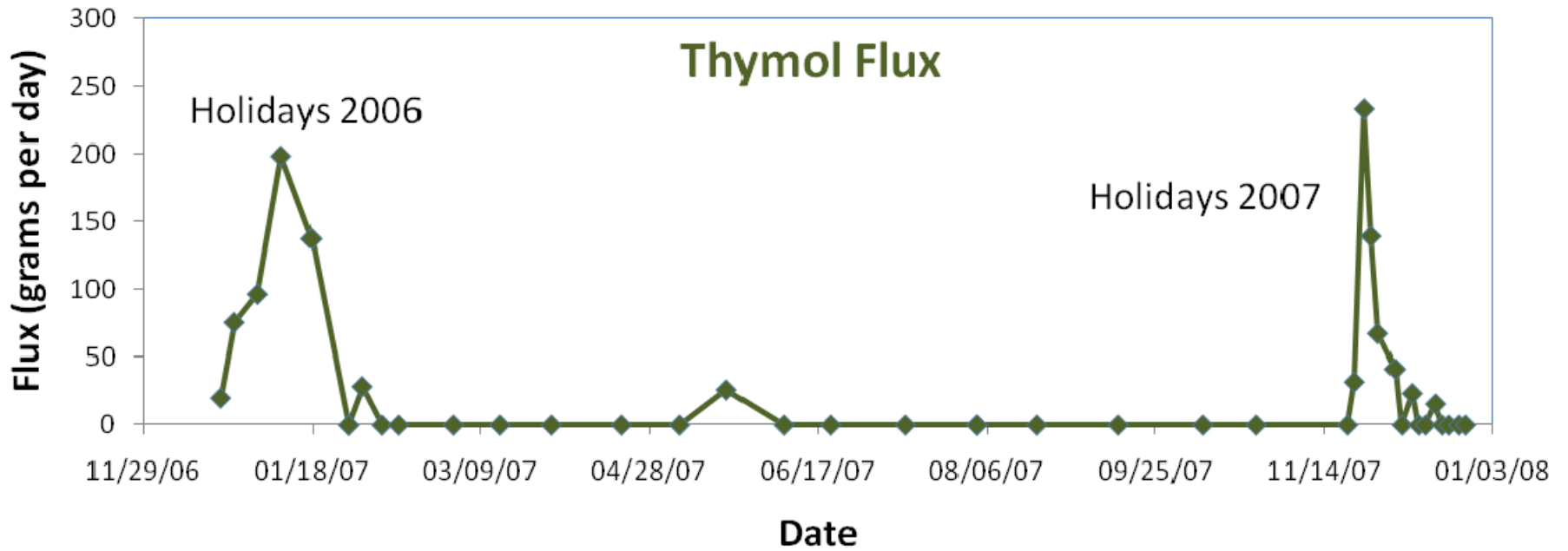
Ethyl-Vanillin



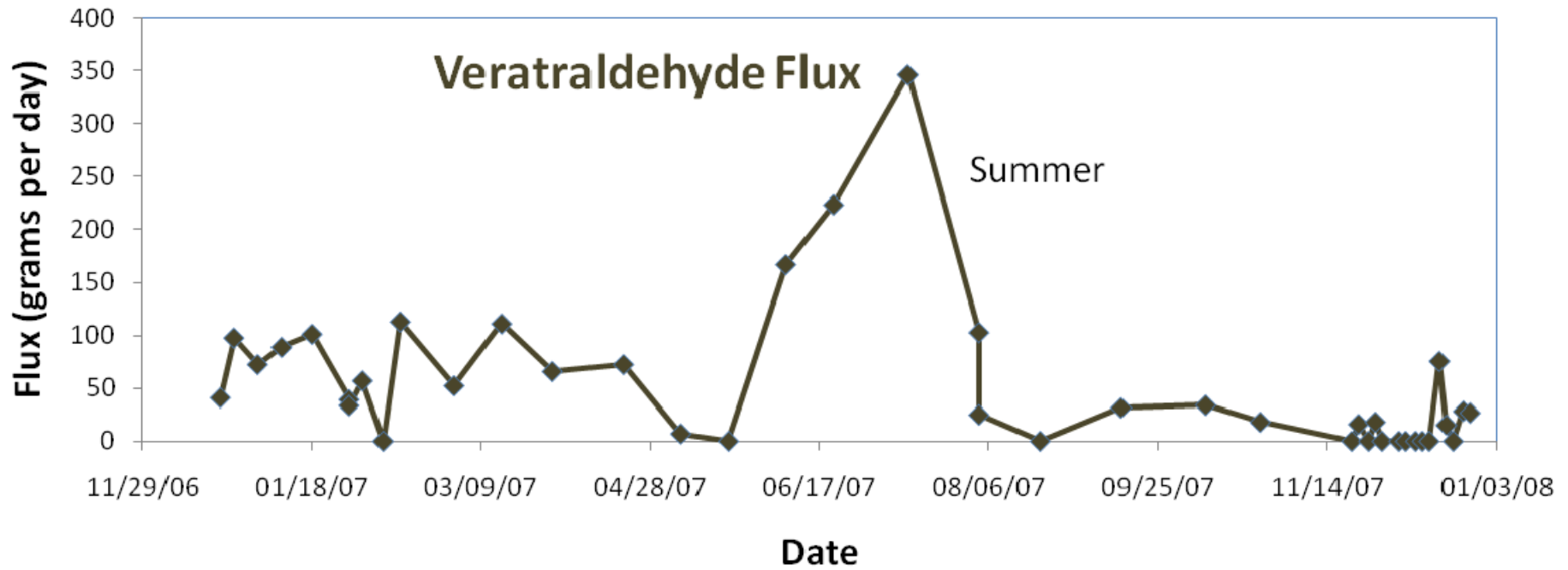
Cinnamon



Thyme



Veratraldehyde



Implications

What we eat winds up in Puget Sound...

- Ethyl-vanillin is not a natural compound yet it is the most abundant spice in the Sound
- The Sound is also loaded with caffeine and chocolate leftovers (King Co. work)
- Spices can be smelled by salmon and are present at concentrations higher than the 'natural' compounds flavoring the Sound

PS Winter Toffee Squares

- 1 cup butter, soft or melted
- 2/3 cup brown sugar
- 1/2 tsp natural vanilla
- 1 tsp artificial vanilla
- pinch cinnamon
- 1/16th of a ground up and dried waffle cone
- 2 cups flour
- 6 oz chocolate chips

Oven to 350, cream butter, sugar and spices, add flour slowly until well incorporated, press into a 9x11 pan in a thin layer, bake 20 minutes or until golden brown, melt chocolate and spread over the top, cut into bars while still warm. Serve with espresso.

rickkeil@u.washington.edu

http://depts.washington.edu/aog/spices.html

Environmental Spices - Windows Internet Explorer

Microbial Organic Geochemistry
at the University of Washington

Main Page | Email MOG | Photos | MOG Members | Publications | Search

This is the website for the Keil lab. UW oceanography has three organic geochemists:

- Anita Ingall's web site
- Julian Sachs' web site
- Rick Keil (here you are!)

Keil Lab Research

- Overview
- Environmental Spices
- Sulfide Preservation
- OM-Mineral Aggregation
- Protein Geochemistry
- Oxygen Exposure Time
- Bacterial Dynamics
- Photorespiration
- Clavequot Sound Expeditions
- Apprenticeship Learning Program

MOG Taught Classes

- Oceanography of Puget Sound (OCN442)
- Marine Biology (OCN351)
- Field Oceanography (OCN220)
- Current Topics in Oceanography (OCN240)
- Marine Organic Geochemistry (OCN522)

Keil Academic Service

- Faculty Senate
- Faculty Club Academic

Environmental Spices

How quickly is the marine environment exposed to the activities of people living along the edges in cities or urban centers? We frequently hear in the news how this company or that oil slick contributed to the alteration of the natural world, but what about the everyday things we do? Does the natural world notice what you ate for dinner last night?

To help answer these questions, we measure a set of fun and benign (non-harmful) compounds that record the daily activities of humans and transport that information into the marine environment. Currently, we are tracking baking spices, coffee and chocolate from the grocery store shelf through your house and your stomach, and then out into Puget Sound.

"What? Spices? That's stupid."

But is it really? Every day we seem to hear of the latest chemical that is bad for us or bad for the environment. The news is sobering and maybe even depressing, but what can we do about it? We are just people living our lives, trying to make it day-by-day.

Isn't it refreshing to hear about something that is NOT bad for the environment, but shows how linked we are to our natural world? That is where our research comes in. Using spices, we can show how rapidly the marine world sees the activities of our daily lives, bringing home the message of a connected world. The bottom line – when we take care of our own health, we also indirectly can take care of the health of the world we live in.

(Disclaimer – we also occasionally measure things that aren't so good for the environment, but that is a different story).

Who is paying for this work?

Nobody but us – we are volunteering our time, working samples into our regular research as we can. We have received in kind (no money) support from

- Theo Chocolates
- King County Water and Land Resources

So, what are we doing?

O=Cc1cc(OC)c(O)cc1

vanilla

THANKS

