The Strait of Georgia is a 30 km wide by 200 km long basin between the British Columbia mainland and Vancouver Island on the west coast of Canada. While there are hundreds of rivers and streams that flow into the Strait, its estuarine circulation is dominated by the Fraser River, a snow-pack fed river whose daily average flow varies from ~500 m$^3$/s in winter to ~10,000 m$^3$/s in early summer.

The Strait is the home waters to most of the population of British Columbia and is an important aquaculture region as well as being the waters where the juveniles of numerous major salmon runs start the ocean part of their lives. In common with many west coast estuaries, the Strait of Georgia has a major spring phytoplankton bloom. Inter-annual variations in the timing of spring blooms has implications for upper trophic levels due to timing mismatches that disrupt the food chain, and changes in the length of growing seasons for some species.

SoG [1,2] is a coupled physics-biology model for deep estuaries:
- Vertical 1-D model with parametrized 2-D processes
- Upper 40m of water column in the vicinity of S3
- Not in the Fraser River ebb-plume, but strongly affected by freshwater
- 0.5m grid spacing to resolve density, nitrate and phytoplankton gradients

Simple nitrate/phytoplankton biological model:
- All biology advected and mixed by physical model
- One class of phytoplankton: *Thalassiosira* spp. which typically blooms first in the Strait

As of 2014-02-20, the current best estimate of the first 2014 spring diatom bloom in the Strait of Georgia is 2014-03-26. That estimate is based on running SOG with the following parameters:
- Run start date/time: 2013-09-19 00:00:00
- Actual wind, meteorological, and river flow forcing data to 2014-02-20, and averaged data thereafter

Best estimate bounds on the bloom date are:
- No later than 2014-04-14, based on using actual forcing data to 2014-02-20, and data from 1998/1999 thereafter.

SoG-bloomcast [3] is a Python wrapper around SOG to do daily, operational forecasts of the spring bloom.

1. Get near real-time forcing data from web services:
   - Hourly wind at Sand Heads from climate.weatheroffice.gc.ca/
   - Latest available date sets transition from actual to "future" weathers
   - Hourly cloud fraction, air temperature and relative humidity at YVR from climate.weatheroffice.gc.ca/
   - Daily average discharge for Fraser and Englishman Rivers from www.wateroffice.ec.gc.ca/

2. 3 concurrent runs of SOG:
   - All start with actual forcing until latest available wind date
   - Average conditions continue with average forcing from 1968-2010
   - Early bloom conditions continue with forcing from 1992/93
   - 1993 had the earliest spring bloom hindcast since 1968 [2]
   - Late bloom conditions continue with forcing from 1998/99
   - 1999 had the latest spring bloom hindcast since 1968 [2]

3. Analyze run results to calculate bloom date and early & late bounding dates

4. Create time series and profile plots

5. Render results and plots as an HTML page via a template

6. Push HTML page to web site eos.ubc.ca/~sallen/SoG-bloomcast/results.html

As of 2014-02-20, the 2014 bloom is predicted to be close to the average of bloom dates hindcast since 1968.

It is 4 to 8 days earlier than the prediction for the 2013 bloom was at this time last year, but that is within the margin of error of the prediction.

Recent significant mixing events associated with wind storms have pushed the predicted bloom date almost a week into the future. Similar jumps in the prediction were observed in 2012 [4] and 2013 [5] due to storms during March. Contrariwise, an opportunely timed period of clear, calm weather can accelerate the bloom.

**References**

[3] Allen, S.E. and A.M. Wolfe. Recent significant mixing events associated with wind storms have pushed the predicted bloom date almost a week into the future. Similar jumps in the prediction were observed in 2012 [4] and 2013 [5] due to storms during March. Contrariwise, an opportunely timed period of clear, calm weather can accelerate the bloom.

**Datasets**