Real-Time Water Quality Deployment Report

Paddy's Pond

November 2, 2018 to April 12, 2019

Government of Newfoundland & Labrador
Department of Municipal Affairs and Environment
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

Real-Time Water Quality Deployment Report
Paddy's Pond
2018-11-02 to 2019-04-12

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- This deployment period marks the second consecutive year of continuous through-winter monitoring of water quality at Paddy's Pond.
- Hydrometric data included in this report is provisional and used only for illustrative purposes. Corrected and finalized data may be retrieved from the Water Survey of Canada website (http://www.ec.gc.ca/rhc-wsc/)*.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.
    - Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
    - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

Table 1: Qualitative QAQC Ranking

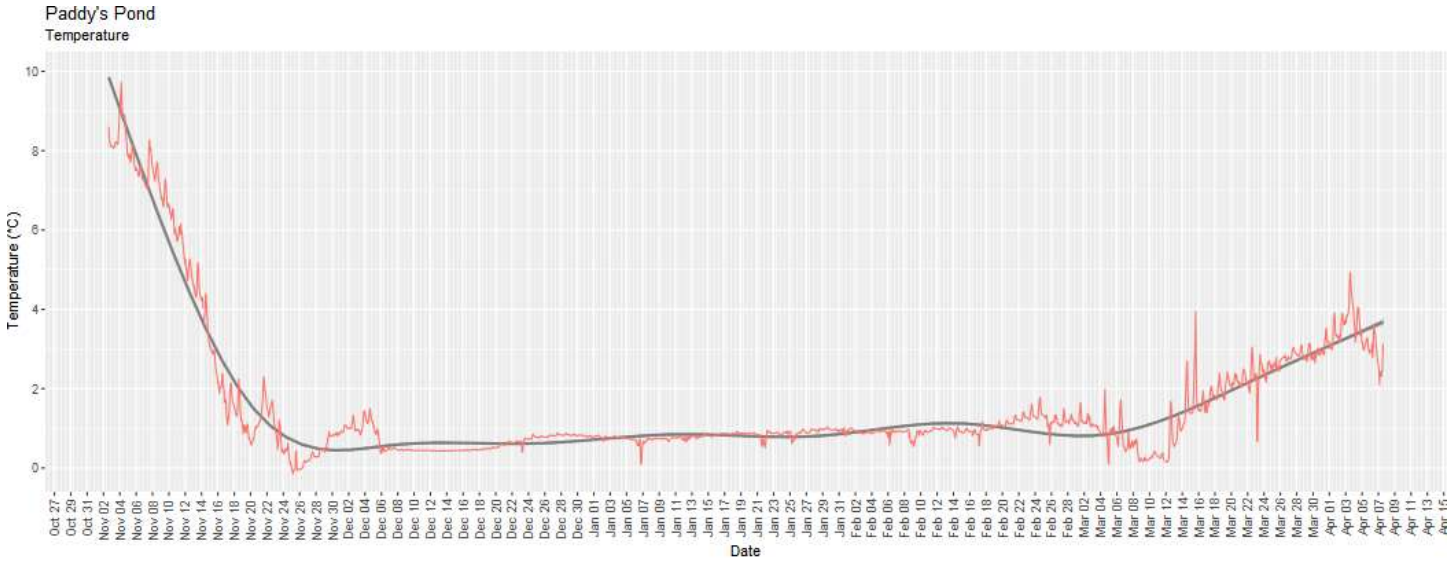
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond	November 2, 2018	Deployment	Excellent	Excellent	Fair	Excellent	Excellent
	April 12, 2019	Removal	Good	Poor	Excellent	Fair	Excellent

- A "Poor" ranking was returned following removal. This may be due to calibration drift occurring over the long winter season.

Data Interpretation

Temperature

Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.

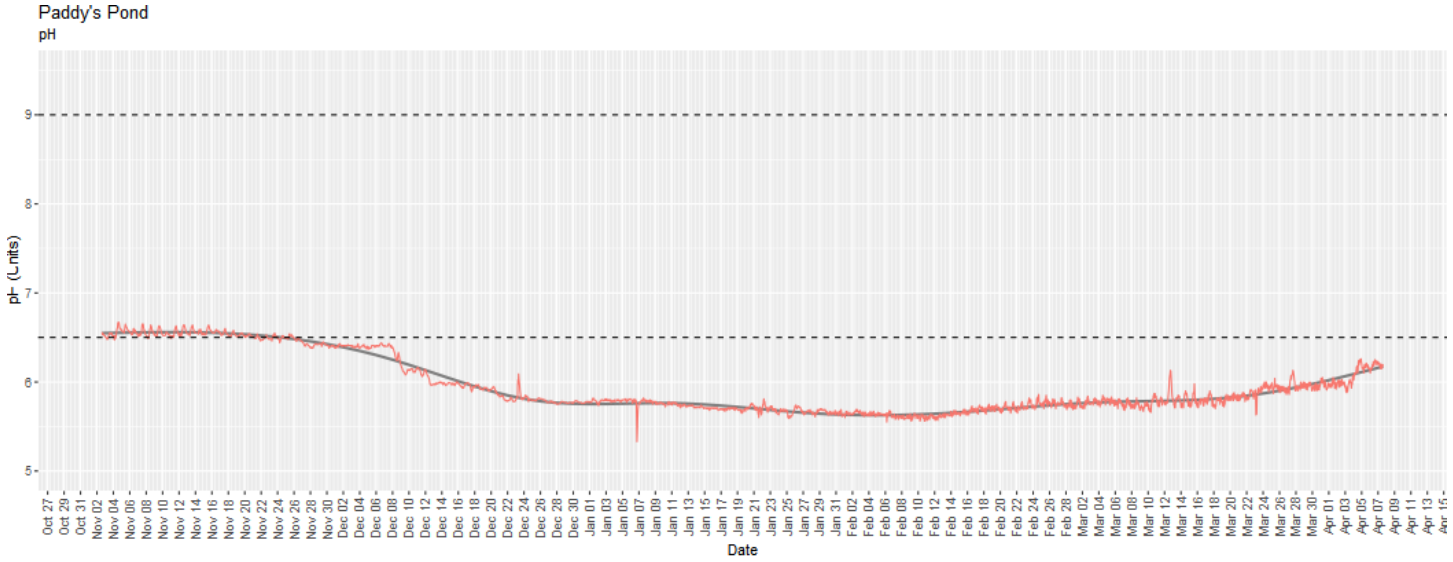


Mean	Median	Min	Max
1.59	0.92	-0.15	9.74

- A precipitous drop in temperature from late October through late November led to a relatively stable trend through winter. During the ice cover season, water temperature slowly increased until ice cover finally melted in late February and early March. Shortly after the spring thaw, water temperature quickly climbed towards the end of the deployment period.

pH

pH is used to give an indication of the acidity or basicity of a solution. A pH of 7 denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.

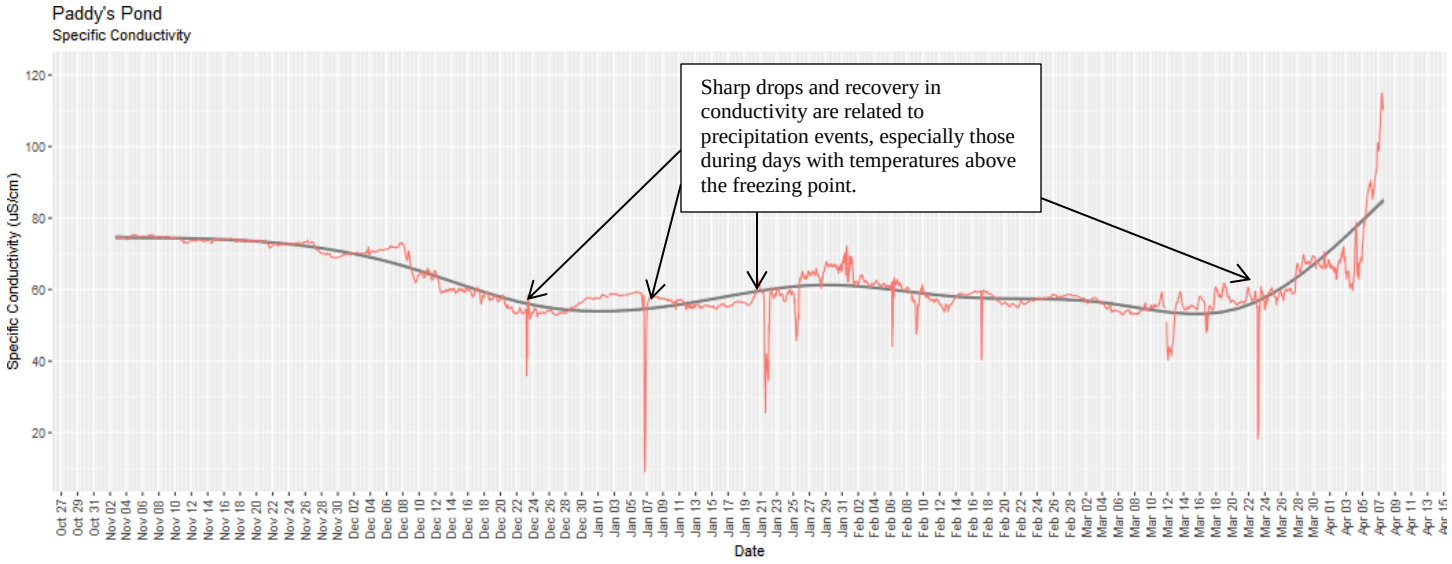


Mean	Median	Min	Max
5.96	5.80	5.33	6.67

- As ice cover formed on Paddy's Pond, gas exchange between the water and atmosphere was greatly reduced. A simultaneous reduction in photosynthesis by aquatic plants allowed for dissolved carbon dioxide concentration to increase and favour the production of carboxylic acid, thus lowering pH.
- As ice melted and photosynthesis resumed in the later portion of the deployment period, pH subsequently increased.

Specific Conductivity

Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25°C to allow comparison across variable temperatures.

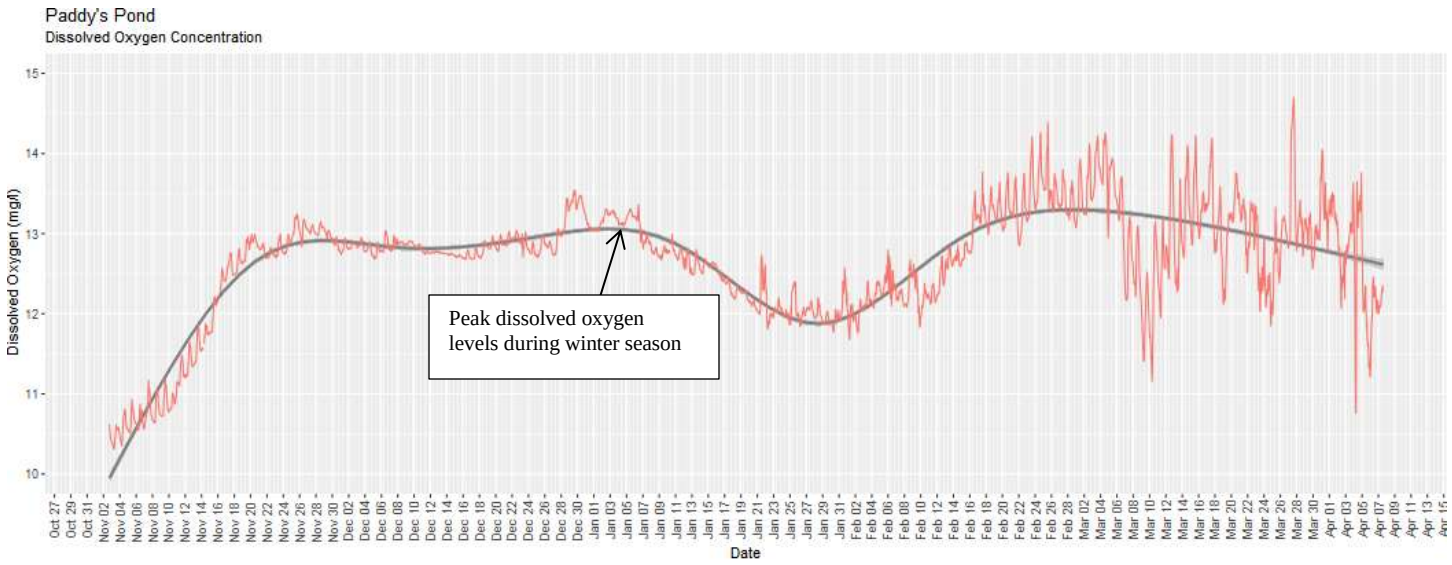


Mean	Median	Min	Max
62.13	59.05	9.10	114.87

- Specific conductivity declined from the outset of the deployment period and was at its lowest point during ice coverage. Variability was common during the ice cover period, despite the supposed reduction of influence from weather conditions. A number of sharp drops in conductivity occurred during the ice cover season when air temperatures (seen in Appendix) were above 0°C.

Dissolved Oxygen

Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.

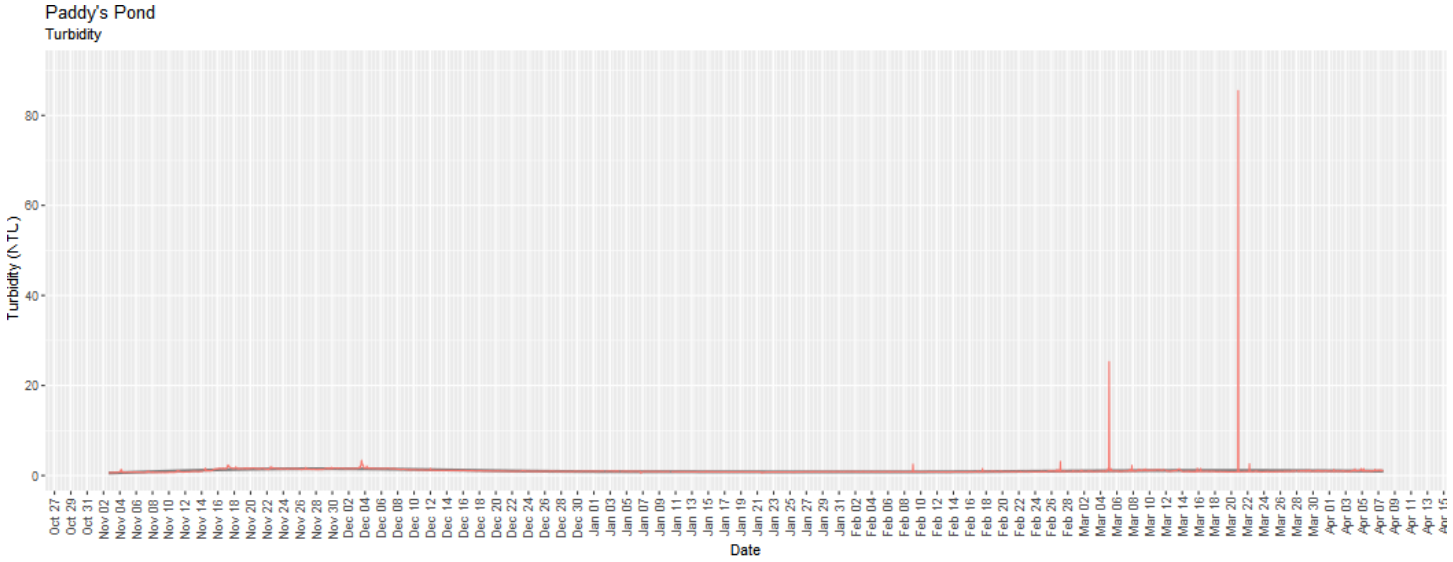


Mean	Median	Min	Max
12.7	12.8	10.3	14.7

- As water temperatures declined, dissolved oxygen concentrations increased to near maximum saturation levels. In early January, a mid-deployment decline in concentrations was seen following a warming trend and precipitation. Oxygen concentrations slowly increased once again just prior to the melting of ice cover.
- As ice cover was reduced, variability in oxygen concentrations was notable due to gas exchange with the atmosphere. A slight downward trend is obvious near the end of the deployment period due to the rising spring water temperatures.

Turbidity

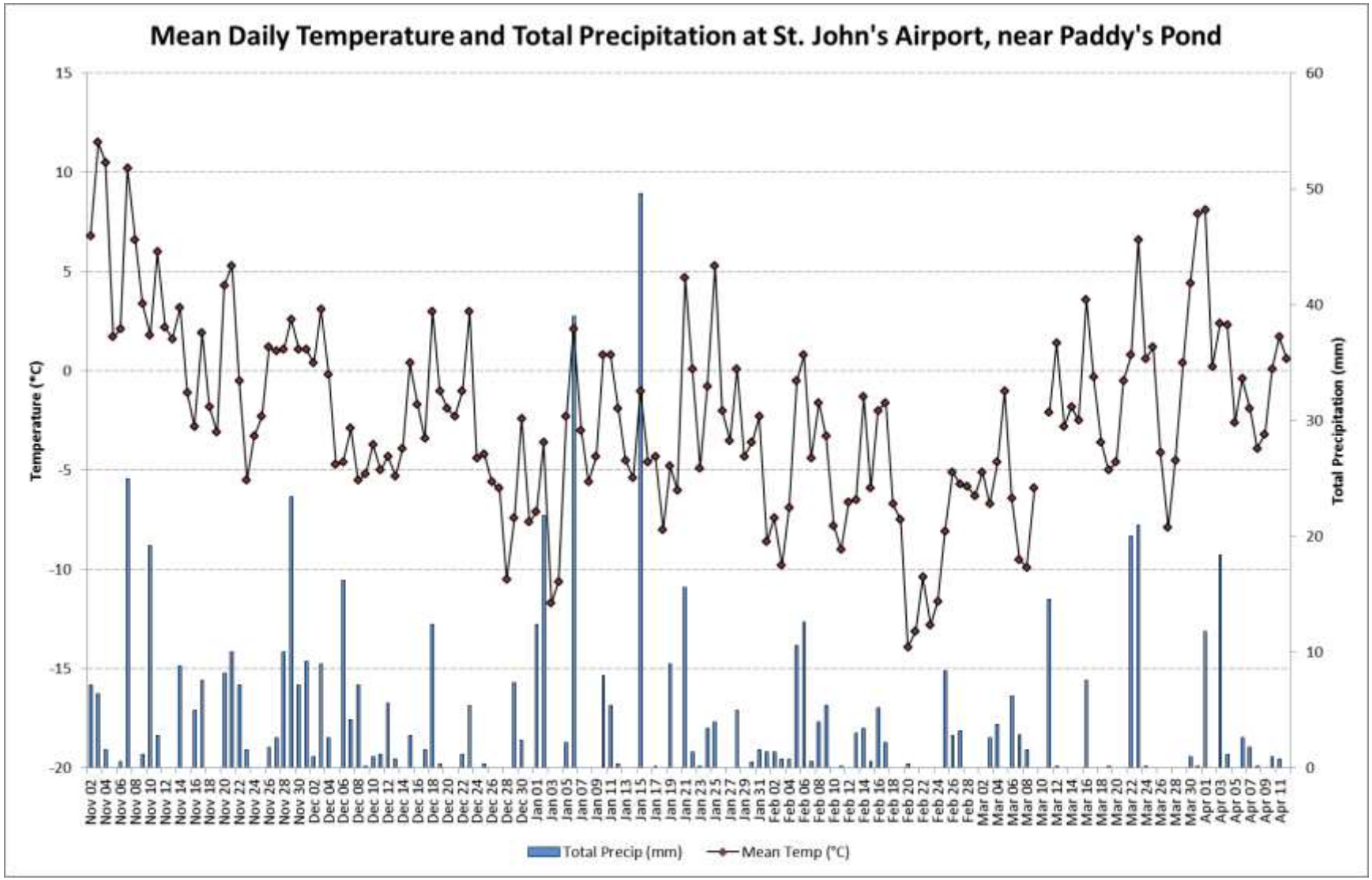
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Mean	Median	Min	Max
1.0	0.9	0.5	85.5

- Turbidity levels were very low during this deployment period with periodic, likely random, events.

Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, near Paddy's Pond
Temperature (°C)
Total Precipitation (mm)
Total Precip (mm)
Mean Temp (°C)