



## What's New in HydroLight-EcoLight Version 6.0?

The HydroLight-EcoLight version 6.0 software package has several major new features compared to the previous version 5.3:

- **Native versions of the user interface and executables are available for Microsoft Windows, Linux, and Apple OS X operating systems.** Each of these versions uses the same source codes for solution of the RTE and for the user interface. However, those source codes are compiled separately for different operating systems. The look and feel of the user interface is unchanged and is the same for each operating system. Existing Windows licence holders can purchase installations for other operating systems at a reduced fee.
- **Excel spreadsheets can now be created automatically at the end of a run.** It is no longer necessary to convert intermediate HydroLight output files to spreadsheets via Excel macros.
- **User-supplied data files have a more general format.** In particular, descriptive file information is now set off by `\begin_header` and `\end_header` records, so that there can be any number of header records to document the file contents. The previous format that required exactly 10 header records can still be used. The end of user-supplied data files can now be flagged by `\end_data` records.
- **Absorption and scattering by pure water can be computed as functions of temperature and salinity.** Models of pure water optical properties from the recent literature are now implemented to use the same temperature and salinity inputs as are used for computation of the water real index of refraction.
- **Sea surface reflectance and transmittance functions now account for both surface elevation and surface slope variances.** There are now three options for modeling sea surfaces. The azimuthally averaged Cox-Munk surfaces used in version 5 are retained. There is also an option to use Cox-Munk slope statistics for anisotropic surface slopes. Most importantly, there are new surface functions that used 2D wave elevation variance spectra and fast Fourier transforms to generate the random surface

realizations that underlie the surface functions. Those functions properly account for wave shadowing when sun and viewing angles are near the horizon.

- **Most users will never need to recompile the code.** Executables distributed with the software will handle almost all simulations. Previously, some options selected in the user interface triggered automatic recompilation. Now, only users who wish to change the source code will need to recompile.
- **There are new options for user-defined IOPs.** Advanced users who wish to model IOP components that are not part of standard bio-geo-optical models can use a generic user-defined IOP model to define up to ten IOP components without the need to rewrite the user-defined IOP subroutine. This allows easy inclusion of IOP components such as oil droplets, microbubbles, or multiple phytoplankton types.
- **All source code has been fully rewritten.** Previous versions of HydroLight traced back to Fortran 77 code that was written by Curtis Mobley when he was a post-doc in the early 1980s. Over the decades, that code became increasingly complicated, hard to understand, hard to maintain, and just plain ugly. For version 6.0, Mobley rewrote every line of the mathematical code (over 30,000 lines) into very clean Fortran 95. Similarly, the graphical user interface for version 5 was written in Visual Basic and therefore ran only on Microsoft Windows. John Hedley rewrote the user interface using platform independent C++ and Qt5. Those codes are then compiled to create user interfaces for Windows, Linux, and Apple OS X operating systems
- **The code is now distributed over the internet.** It is no longer necessary to install the code from a CD.
- **There are new User's Guides and Technical Documentation to fully document the various changes.**

Please see the version 6 User Guide and Technical Documentation for the details of these new features, and contact either John Hedley or Curtis Mobley with any questions.