Year 1 goals as listed in proposal:

- Produce swath-level U fields
- Produce diurnal cycle calculations, initial SST fields
- Prepare swath-level Qa, Ta fields
- Compare diurnal cycle calculations with in situ measurements
- Prepare SeaFlux workshop -- discussion of version 1

We have currently been making progress on several of these goals: producing swath-level U, Qa, and Ta fields, creating diurnal cycle calculations, and preparing the SeaFlux Workshop. These are all summarized below.

(1) Produce swath-level U, Qa, Ta fields

We have recently gained access to the Wentz SSM/I calibrated brightness temperatures, and are working towards applying our neural net technique to these temperatures for retrieving U, Qa, and Ta. We anticipate another two months before we have a version that we feel comfortable with (i.e., well-developed and compared with observations). In addition, we have been working on including additional inputs from the AMSU + AMSR fields. An example of the improved Ts-Ta fields from the use of the additional data is shown below. We have a few tweaks we can do to improve the RMS error a bit more but even so these results are significantly improved from past work that has been done.

Results from comparisons of the new neural network air temperature from the AMSU-AMSR measurements with in situ values.
The goals for this for the rest of the year then are to finish the neural net versions using the new Wentz calibrated brightness temperatures plus the AMSU-AMSR data.

(2) Diurnal cycle calculations

Significant work has been ongoing in this area. A major shortcoming of the previous parameterization that we have been using (the Clayson and Curry from 1996) has been shown to be the underestimation at the very highest end. To that end I have updated the entire ocean model that this parameterization was based on, essentially by recognizing that under certain circumstances my background dissipation was too high in the very near surface layer. In addition it is clear that a length-of-day attribute needed to be added (not included in ANY parameterizations available at this point). Finally, the simulated curve was simply a sine curve with a peak at solar noon, which is also not physically appropriate (see figure below). All of these are now included in the new parameterization.

Results from the new ocean model used in the parameterization. (Left panel) Waterfall plots of temperature in the upper 5 m under conditions of calm winds, high solar insolation. Temperatures are displaced by 0.25 degrees every hour. Peak diurnal warming reaches over 6°C in this case. (Right panel) Solar radiation and SST warming, showing lag in peak warming as well as diurnal shape of the SST (not sinusoidal).
For the rest of this project year we will be using these new results to calculate global diurnal warming amplitudes and comparing our results with in situ observations to produce error estimates. We should also note that we have made close contacts with the NOAA/NESDIS STAR group as well, and we will be using this parameterization with their SQUAM work to determine to what extent we can reduce errors in their foundation SSTs. We anticipate that we will all be learning something from that exercise.

(3) Prepare SeaFlux workshop

After some deliberations and discussions, it appears that our next SeaFlux workshop will be held jointly with the LandFlux workshop, and jointly with the AMS conferences on Air-Sea Interaction and Planetary Boundary Layers and Turbulence. This should vastly increase the numbers of researchers who will attend (particularly those who are interested but immediately a part of SeaFlux), as well as provide the linkages to LandFlux we have been interested in making. This would occur in (potentially) Minneapolis in late June of 2012. With this kind of organization however it is possible that changes will occur to that, however, this is approximately the time frame that it should work for.

Papers we anticipate finishing within the next six months:
(1) The new version of the ocean model, with a focus on how such issues as length of daylight affect diurnal SSTs
(2) The new parameterization of diurnal warming
(3) The new Ta, Qa, U, and SST from AMSU-AMSR combined fields
(4) A description of the original SeaFlux version 1.0 dataset
Year 1 goals as listed in proposal:

• Produce swath-level U, Qa, Ta fields
• Produce diurnal cycle calculations, initial SST fields
• Prepare swath-level Qa, Ta fields
• Compare diurnal cycle calculations with in situ measurements
• Prepare SeaFlux workshop -- discussion of version 1

We have currently been making progress on several of these goals: producing swath-level U, Qa, and Ta fields, creating diurnal cycle calculations, and preparing the SeaFlux Workshop. These are all summarized below.

(1) Produce swath-level U, Qa, Ta fields

We have used the Wentz SSM/I calibrated brightness temperatures for applying our neural net technique to these temperatures for retrieving U, Qa, and Ta. We just gained access to the new CSU brightness temperatures, and will try using both. Currently we have swath-level U, Qa, and Ta fields that we are making available on a trial version (as part of the SeaFlux v 1.0 dataset). These are still based on the beta CSU brightness temperature dataset, and as such are only available from 1998 - 2007. An example of the improved Ts-Ta fields from the use of the additional data is shown below. We have a few tweaks we can do to improve the RMS error a bit more but even so these results are significantly improved from past work that has been done.

Results from comparisons of the new neural network air temperature from the AMSU-AMSR measurements with in situ values.
Results from comparisons of the new neural network wind speeds using Wentz brightness temperatures and AMSU-AMSR measurements with in situ values.

The goals for this for the rest of the year then are to finish the neural net versions using the new Wentz calibrated brightness temperatures plus the AMSU-AMSR data, and also to work with the CSU brightness temperatures to see if there is any difference in the means/trends of the datasets. We are also currently working on using the U fields in at least the rain-flagged portions of the CCMP winds that we used in the SeaFlux version 1.0 fields.

(2) Diurnal cycle calculations

Significant work has been ongoing in this area, most of it occurring in the first half of year one, and as such is simply duplicated here. A major shortcoming of the previous parameterization that we have been using (the Clayson and Curry from 1996) has been shown to be the underestimation at the very highest end. To that end I have updated the entire ocean model that this parameterization was based on, essentially by recognizing that under certain circumstances my background dissipation was too high in the very near surface layer. In addition it is clear that a length-of-day attribute needed to be added (not included in ANY parameterizations available at this point). Finally, the simulated curve was simply a sine curve with a peak at solar noon, which is also not physically appropriate (see figure below). All of these are now included in the new parameterization.
Results from the new ocean model used in the parameterization. (Left panel) Waterfall plots of temperature in the upper 5 m under conditions of calm winds, high solar insolation. Temperatures are displaced by 0.25 degrees every hour. Peak diurnal warming reaches over 6°C in this case. (Right panel) Solar radiation and SST warming, showing lag in peak warming as well as diurnal shape of the SST (not sinusoidal).

Results from the new ocean model used in the parameterization. (Left panel) Diurnal warming from the new model for a variety of input solar radiation inputs, wind speeds, and precipitation values. All values are for a 12-hour daylight condition. (Right panel) New SST curve parameterization.

We have now used this data to calculate global diurnally-varying SST fields over the 1998 - 2007 time period, and are now comparing with various available in situ and satellite data sets. These data are also available as a beta dataset to users who have requested them. An example is shown below. We should also note that we have made close contacts with the NOAA/NESDIS STAR group as well, and we will be using this parameterization with their SQUAM work to determine to what extent we can reduce errors in their foundation SSTs. We anticipate that we will all be learning something from that exercise.
One day peak maximum diurnal warming using the new improved parameterization.

(3) Prepare SeaFlux workshop

After some deliberations and discussions, it appears that our next SeaFlux workshop will be held jointly with the LandFlux workshop, and jointly with the AMS conferences on Air-Sea Interaction and Planetary Boundary Layers and Turbulence. This should vastly increase the numbers of researchers who will attend (particularly those who are interested but immediately a part of SeaFlux), as well as provide the linkages to LandFlux we have been interested in making. We have identified the actual time of the meeting to occur July 8 - 13, 2012 in Boston, MA. We have collaborated so far on the conference portion of the meeting, and will need to continue planning how to have the SeaFlux and LandFlux breakouts.

(4) Release of beta version of SeaFlux 1.0

This dataset has now been made available to those who request it. We are working through how to document, how to format the data, and other issues as we are made aware of them.

(5) Porting of data to WHOI computers

This process is well underway. We have now much more space available to us, and we will continue to now be able to use the various brightness temperature datasets in comparisons and create the longer time series.

(5) Next goals

Next goals are to use the CSU brightness temperatures and compare. Once a decision has been made which brightness temperatures to use, the dataset will be extended back to the 1987 time frame, as well as all goals listed in the Year 2 timeframe. Our new post-doc should also be in place by mid-October at the latest.
Papers we anticipate finishing within the next six months:
(1) The new version of the ocean model, with a focus on how such issues as length of daylight affect diurnal SSTs
(2) The new parameterization of diurnal warming
(3) The new Ta, Qa, U, and SST from AMSU-AMSR combined fields
(4) A description of the original SeaFlux version 1.0 dataset