One of the goals of oceanography is to characterize the pathways and speeds of the ocean's major currents. In pursuit of this goal, a common practice is to perform a time-lagged correlation of measurements (such as temperature or salinity anomalies) recorded at spatially separated observation stations. Statistically significant correlations indicate a current flowing between the stations, and the time-lag at which the correlation is highest measures the current's mean advective speed. Although the practice is common, inferring advective speeds from correlation invites criticism because the physical transport mechanisms are hidden by the correlation. If limited data are available for the analysis, then a natural skepticism originates from the scientific principle that correlation does not imply causation. However even with sufficient data, it is not clear that the peak time-lag of the correlation should necessarily be associated with the mean advective speed of the current. This poster provides a method to interpret oceanic time-lagged correlations in terms of all physical transport processes acting on the flow. We do this by relating correlation functions to the Green's function solution of the transport equation. Green's functions have been used recently as a foundation for characterizing oceanic and atmospheric transport. The main advantage of this approach is that the Green's function contains complete information about the physical transport processes. Thus by relating correlation functions to Green's functions, we provide a more thorough and physically based framework for interpreting time-lagged correlations.