Spaceborne Laser Bathymetry

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Bathymetry and depth mapping of coastal areas play an important role in the safety of navigating ships. It has also implication for areas as diverse as reproductive potential for marine life, sediment transport, shore line erosion and flood hazards.
Mapping of these areas has previously been done by sonar from smaller ships. This method has proven to be extremely expensive for countries with large coastal areas. The coverage of these areas is therefore often quite poor and will rarely contain any information on dynamic aspects.
This issue has been partially solved by airborne measurement systems like SHOALS, which have been able to use airborne laser bathymetry and thereby reducing the costs between 50% to 80%. The cost are, despite this, still high and requires a team to be available for flying and operating the equipment as well as suitable weather and water conditions to be present.
The implementation of bathymetry instrumentation in a satellite system could cover practically any shallow water region present on Earth. It could also give rise to another interesting issue; it could measure the depth changes over time in for example coral reefs, which is of great interest for marine biologists etc.
Furthermore, the system could be able to measure the amount of chlorofyl in the seawater. Information about this is very interesting for biologists as well.
Another reason, which makes this project interesting, is because 90% of all life in the sea is created in the shallow water areas, and therefore it could be interesting to get more information about these areas. A third reason could be for transport. When large ships are sailing in shallow water areas, it happens that it ran aground and causes huge natural disasters. This could be avoided with our new technology.
Laser Bathymetry is based on firing a short laser pulse towards the water surface. The differential time between the arrival of reflections from the surface (Air/water reflection) and from the bottom (Water/Bottom reflection) can then be used to measure the depth. A typical laser bathymetry system consist consequently of a pulsed laser transmitter, a scanning mirror, a transmitter/receiver telescope, narrowband optical filters. Furthermore it needs a fast and very sensitive electronic circuit including a pulse waveform analyser and a computer system to control the sampling, and store the received data. This is problems we would like to investigate in our project.