Understanding what data sets are possible to use with ISCE

ISCE is a package designed to work with data from most of the available international SAR sensors operating in a standard “stripmap” mode. In stripmap imaging, the sensor generates a regular stream of radar pulses and the pointing of the radar beam is fixed to be roughly broadside to the direction of flight of the spacecraft. In this way a continuous swath is acquired for as long as the radar sensor is on. The ISCE package understands the formats of the following sensors:

Satellite	Years of Operation	Repeat cycle (days)	Wavelength (band/cm)	Stripmap Modes	Product level that can be ingested into ISCE
European ERS-1/ERS-2	1992-2001(-2011)	35 (1,3,183)	C / 6	1 strip map	L0
European Envisat	2003-Sep.2010, Oct. 2010-Apr. 2012	35 (30)	C / 6	7 standard modes, including dual-pol	L0
Japanese ALOS	Jan. 2006–Apr. 2011	46	L / 24	SIngle, dual and quad-pol modes	L0 (called L1.0)
German TerraSAR-X TanDEM-X	2007 - present 2010 - present	11	X / 3	Variable resolution and beam pointing	L1 only
Italian COSMO-SkyMed 4 Satellites	2007 - present	16 (1,4,7,8)	X / 3	Variable resolution and beam pointing	L0 L1
Canadian Radarsat-2	2007 - present	24	C / 6	Variable resolution and beam pointing	L1 only

Other sensors, including Japan’s JERS-1, and Canada’s Radarsat-1, have orbit control and knowledge factors that ISCE cannot currently handle for interferometry, so these are not fully supported. In the future, we will be adding them to the available data sets. ISCE understands the individual formats of the Level 0 or Level 1 data and converts them to a standard internal format that is uniform across sensors within ISCE. In this way, the stripmap and interferometric processing can proceed identically for all sensors.

Level 0 (L0; for ALOS, called Level 1.0) data are raw radar pulses that have not yet been processed to imagery but have been conditioned to remove downlink telemetry and fix data transmission errors such as timing glitches and data dropouts. Level 1 (L1; for ALOS, called Level 1.1) data are processed to form complex radar images, often called “single-look complex” images (SLC images). A complex image is a two-dimensional pixel array of complex numbers (real and imaginary parts) which represent the backscattered amplitude and phase of each pixel.

Other modes that many of these sensors potentially can deliver are spotlight mode and ScanSAR mode, the former for focused areas at fine resolution, the latter for broad areas at coarse resolution. Since interferometry is more challenging in both these modes, and data availability is limited, ISCE does not support processing raw data from these modes currently. Spotlight data already processed to Level 1 (SLC) images, including COSMO-SkyMed and TerraSAR-X, can be processed in ISCE if it was acquired with interferometric compatibility.

This lab contains modules 3.1, 3.2, 3.3, etc., starting with a processing example from ALOS PALSAR in module 3.1, and then some discussions about the ISCE outputs. Later labs 4-7 cover other sensors. To a large extent, these modules are independent, so students can run only those sensor modules in which they have interest.