CHAPTER 3   DATA USED AND STUDY AREA

3.1   STUDY AREA:

Mumbai harbour is situated in the western coast of Indian peninsula with Mumbai port (also called as the Gateway to India) in the south section of western edge of the harbour and Jawaharlal Nehru port (largest container port in India) and Navi Mumbai lie to the east on the mainland. Mumbai city is in the south end of Salsette Island one of the six island in the harbour (Source: Wikipedia). The various islands houses the facilities that makes Mumbai harbour a highly economic and strategic importance are:-

(i)   Jawahar Dweep is also called as Butcher Island is an old terminal of Mumbai Port which houses various jetties and infrastructure for loading and offloading crude oil and petrochemical products.

(ii)   Cross island is relatively a small islet off coast the dockyard road.

(iii)   Elephanta island is actually Gharapuri island is a UNESCO world heritage site with Hindu religious rock sculptures and Buddhist religious sculpture dating back to 5th-8th century AD.

(iv)   Oyster rock is a group of small rock cropping under the control of Indian Navy.

(v)   Salsette island is the largest island which consists of Mumbai and Thane. But for the reclamation of land since times

immemorial, it was separated from the main land by the Vasai

creek and the Ulhas river.

3.2   DATA USED:

3.2.1   PRIMARY DATA:

RISAT 1: MRS Level 1 CEOS data (NRSC Data Centre)

    (i)   Date: 15 Nov 2012

    (ii)   Time: 00:59:10.568 to 00:59:28.680 UTC

    (iii)   Pass: Descending; Look direction: Left

    (iv)   Azimuth Look: 1; Range Looks: 2

    (v)   Azimuth Range spacing: 18m

    (vi)   Incidence Angle=36.78364

RISAT 1: CFRS SLC Level 1 CEOS data (NRSC Data Centre)

    (i)   Date: 15 Nov 2012

    (ii)   Time: 13:05:24.295 to 13:05:28.895 UTC

    (iii)   Pass: Ascending; Look direction: Left

    (iv)   Azimuth Look: 1; Range Look: 1

    (v)   Azimuth spacing: 3.33 / 2.47 m Range spacing: 2.34 / 1.80 m

    (vi)   Incidence Angle=35.97349

Sentinel 1A: Level 1 GRDH data (Sentinels Scientific Data Hub)

    (i)   Date: 24 Feb 2016

    (ii)   Time: 01:02:35 to 01:03:00 UTC

    (iii)   Pass: Ascending; Look direction: Right

(iv)   Azimuth Look: 1; Range Looks: 5

(v)   Azimuth Range spacing : 10m

(vi)   Incidence Angle: 39.1

Sentinel 1A: IW Level 1 SLC data (Sentinels Scientific Data Hub)

(i)   Date: 24 Feb 2016

(ii)   Time: 01:02:34 to 01:03:02 UTC

(iii)   Pass: Descending; Look direction: Right

(iv)   Azimuth Look: 1; Range Looks: 1

(v)   Azimuth spacing:13.98m Range spacing: 2.32m

(vi)   Incidence Angle: 39.1

3.2.2 SECONDARY DATA:

The port calls and archival AIS (Automatic Information System) data of the Mumbai port area and ship identification & meteorological data from Sea-web (a unit of IHS previously Lloyds database) and/or from the Director General, Shipping Corporation, Mumbai for ground truth and validation of positions of the ships and the number of ships available in Mumbai Port area including Mumbai port, anchorage and Jawahar dweep. Similarly to cross validation of the data with Sentinel-1A data, bigocean data on trial basis was carried out for test ship MV Nand Panna (IMO-8219140). Towards this archival satellite AIS (Automatic Information System) data, corresponding time stamped sea weather data and the port call data for the date of SAR scene was obtained.

3.3 DATA ANALYSIS:

Before handling the data analysis, it is imperative to evaluate the limitations of the data and the merits of the data towards the desired outcome. The aim of the analysis was to clearly understand the type of data being handled. The analysis indicated the following:-

(i)   RISAT-1 MRS data is geo-coded and calibrated however in order to generate the back scatter standard tools should be applied.

(ii)   RISAT-1 CFRS-1 data is primarily SLC data and is not geo-coded but calibrated however in order to process further a suitable filtering like Gamma map should be applied or standard tools can be directly applied to get the derived matrices for further analysis and thereafter can be geo-coded to reference it to the required datum. The important interesting phenomenon of SLC (Single Look Complex) is that based on the ascending or descending node and the look direction, the data obtained may be required to be flipped and rotated to get into the correct orientation. In the case of RISAT-1 CFRS-1 data, since the data was obtained in ascending node with look direction to left, the data needs to be flipped and rotated by 180 deg to get into the correct orientation. Alternatively, in order to get the derived parameters to the required orientation, it can be geo-coded using ENVI and SarScape to derive outputs.

(iii)   Sentinel-1A GRDH data is geo-coded but not calibrated however in order to get the back scatter Sentinel-1A toolbox should be used to flipped and calibrated for further analysis.

(iv)   Sentinel-1A IW (Interferometric Wide swath) mode data also revealed that it was geo-coded but not calibrated; however in order to further process basic operation of flip, de-burst and merge to be done before further analysis.

(v)   Data obtained from AIS data needs to be sorted and different class of ships based on the class definition derived from the semi-empirical formulation of Gross Tonnage.