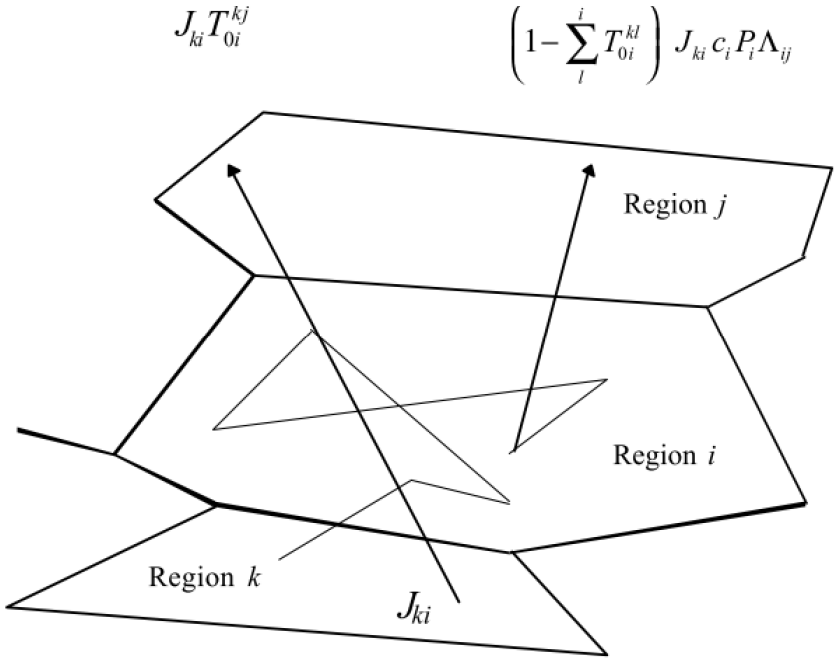

Figure 5: Transport Escape Probability (TEP) schematic diagram in 2-D geometry [15]

- ionized by interaction with electrons, which produces
  - a plasma ion in the ion particle balance equation Equation (2) and
  - an ionization cooling term in the ion energy balance equation Equation (20); and
- interacts with a plasma ion to effectively replace a hot ion with a cool ion (charge exchange cooling term in the ion energy balance equation Equation (20)).

The transport of these neutrals are modeled using Transport Escape Probability (TEP) methodology [21, 25, 27, 15, 29, 10, 31]. The TEP physics are based on a probabilistic description of interacting and transmitting particles within a region of interest (i). The partial current, J_{ij} from a region i (note this is not indicating ions) to region j is described by Equation (33).

$$J_{ij}=\sum_{k}^{k}J_{ki}T_{0i}^{ku}+\sum_{k}^{i}\left(1-\sum_{l}^{i}T_{0i}^{kl}\right)J_{ki}c_iP_i\Lambda_{ij}+s_iP_i\Lambda ij^{s} \tag{33}$$

The first term accounts for all of the partial currents entering region i (see Figure 5 on page 10) from all contiguous region k that transmit through region i. This is found by multiplying edge currents, J_{ki} by the transmission probability T_{0i}^{kj}. The second term represents all of the partial currents entering region i from contiguous regions that suffer a collision inside of region i. The collision probability is c_i, the escape probability is, P_i and the probability that scattered particles from region i escape to region j Λ_{ij}. The third term represents any internal source, such as recombination. Further description can be found in Section 2 of Rubilar, Stacey, and Mandrekas [15].

For our purposes, it has been suggested that a simplified neutral transport implementation from Stacey 2000 [25], utilizing GTNeut, should suffice. The simplified model breaks the plasma into regions shown in Figure 6 on page 11. This modeling approach will be utilized initially and modified as needed.

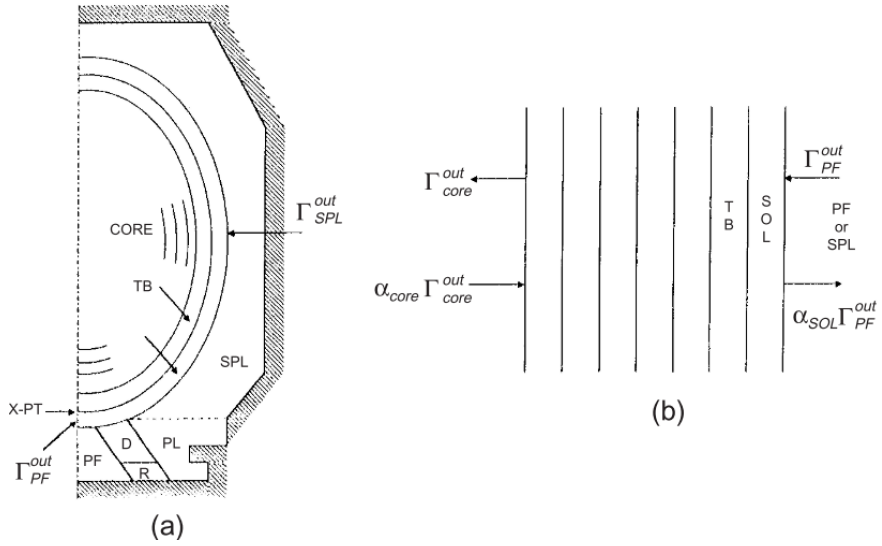

Figure 6: Schematic diagram of the neutral transport model: (a) 2-D TEP model of divertor plasma (D), recycling region (R), private flux (PF), plenum (PL) and SOL plenum (SPL); (b) 1-D ICB model of penetration through SOL and transport barrier (TB) into core. [25]