

Episode No. 9
Radio Serial on Climate Change and Global Warming

Ocean-atmosphere variability

Song of the Sea

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Since more than 70 percent of the earth's surface is occupied by oceans, climatic conditions on the earth are obviously governed by oceans. Perturbations on ocean create great impact on the atmospheric conditions and generate internal climate variability.

This episode elaborates the role of oceans in governing the climate system of the earth and also talks about the related phenomena such as El Nino, La Nina, Southern oscillations, Thermohaline circulation, climate inertia, etc.

List of Characters:

Molu :	A school going boy – Age 10 to 12 years
Grandma :	Great - grandmother of Molu (About 70 years old)
Noha :	A fisherman (Age about 35 years)
King :	Age about 45 to 50 years
Captain :	Captain of the ship (Age about 60 years)
Chief Officer :	Officer in charge of the ship after the Captain (about 45 years old)
Riya :	A lady who is climatologist / weather scientist (about 40 years old)

(Note : The characters **Noha** and **Captain** can be played by the same artist with voice change and with different accent. Similarly, the characters King and **Chief** Officer can be played by the same artist)

[Molu has just finished his exams and want to enjoy vacation. He is talking to his great – grandmother]

Molu : (with all the excitement, calling) Grandma.... Where are you?I want here a story from you....

(Grandma talking to him from inside and comes slowly out of her room)

Grandma : Beta Molu, I am here! What happened? What do you want?

Molu : Grandma, I want to listen a beautiful story from you. Remember, you have promised me to tell a story after finishing my exams.

Grandma : (Laughing)Yes...

Molu : Then tell me now.... My exams are over! I am a free bird now!

Grandma : (Laughing) okey...Molu! I will tell you a story! But, let me drink a sip of water first.

(Grandma takes water in stainless steel glass and drinks)

Molu : Ready???

Grandma : (Laughing)Yes! Now listen. This is the story of a wise man...Noha.

Molu : Ohh!

Grandma : Noha was a righteous man, blameless among the people of his time.He was living on the sea coast with his family. On one fine morning, instead of going for the fishing as usual, he started making an ark.

Molu : (Surprisingly)Ark?

Grandma : Yes.... A huge ark.

Molu : But why?

Grandma : (Laughing) Why... Everyone was asking the same question to Noha.But he did not tell anybody about it. And one day.... he was called by the King...

(The scene changes. It is the scene of court of the king. The king is about to arrive in the court. Relevant background music should be played)

King : (In orderly voice)Noha, I came to know from my soldiers that, you are making a huge ark?

Noha : Yes...your majesty.

King : But why?Why such a huge ark? Have you been told by our enemy?

Noha : No...your majesty! Not by the enemy.... but by the God himself!

King : God? Are you making me fool, Noha?

Noha : No...your majesty! I am saying the truth. The God came in my dream and told me that within a month there will be a huge flood. The sea level will rise and everything on the coast will be wiped out.The God wants this Earth to be clean!

King : That's why you are making huge ark? Ohh come on Noha, don't make me fool.

Noha : Trust me your majesty! I am sorry... but our kingdom.... I am worried about....

King : Don't worry about the kingdom, Noha. I am capable enough to take care of it. It's better, if you take care of yourself and your mental health.

(Change over Music piece. Again the dialogue between Molu and Grandma starts)

Grandma : The king did not feel keeping trust on Noha's dream. According to him, Noha was foolish and wasting time on nonsense things.

Molu : What happened next, Grandma?

Grandma : Molu, Noha was not fool. After a month or so, there was a cyclone formed over the sea. It was a huge cyclone which had never been experienced by Noha before. (Give sound effects of cyclone, rains and sea waves on the background) Sea was literary roaring and marching ahead with its tall waves....It then started raining heavily.... Within no time everything was submerged except Noha's ark! Noha and his family went inside the ark. He took all those people who wanted to come with him. There were many animals also.... took shelter in Noha's ark. The sea has shown its furious nature and took everything under its water. Only those survived who came in the Noha's ark.....

Molu : Ohhh...No Grandma! How is this story? It's not at all real....something like a myth!

Grandma : Molu, it's our fortune that the story is not turning into reality, but yes, if we continue to live like this, then this story will be no longer a myth.

Molu : Come on Grandma, I don't understand what you are saying.

Grandma : *(laughing)* Molu, I mean to say, in future the story will occur in reality!

Molu : How is it possible?You are talking about the God coming into the dream and eventually, the dream is coming true.....(laughs) Grandma, we are living in the era of smart phone and not in the mythological era of gods and goddess!

Grandma : Yes, I know it Molu. But try to understand. The 'God' in the story is nothing but 'Nature'.... Our surroundings.... the eco-system! Now if we don't listen to the nature, obviously we have to pay for it.... And we require to pay heavily.

Molu : I don't understand, Grandma.

Grandma : Molu, almost in every week the news comes in the newspaper regarding global warming and climate change. We have surely started facing the consequence of global warming. We are now experiencing delayed rains... early arrival of summer....and what not. But another furious thing will occur in future.....

Molu : What is that, Grandma?

Grandma : Experts and scientists say that if temperature of the earth increases with present rate then ice in the polar regions of the earth will melt. The water will spread all around and sea level will rise significantly. As a result, some islands, coastal areas will be submerged permanently.

Molu : Ohh my God!

Grandma : *(sarcastically)* So, now you remember the 'God'! (laughs)

Molu : Ohhh Grandma.... Come on. Please don't make fun of me. I understood your point. If we do not wake up now, it will be too late.

Grandma : Correct! So listen to the nature. Be prepare for better future, like Noha.

Molu : Yes...Grandma!

Grandma : (laughing) But now go to your bed. It's too late now. To do better work, you must take better sleep also.....

Molu : Yes...Grandma! Good night!

Grandma : Good night....Sweet dreams!

(Change over Music piece. Molu and Grandma go to sleep.)

(The next scene starts with a sound of sea waves and a ship cruising through the sea. Riya and Chief Officer in the ship are talking and they are also having cup of tea. Sounds of cup and saucer are heard in between)

Officer : So, what do you feel Riya, about our mission? Will it be a success?

Riya : I can't predict regarding the success of our mission. It's your cup of tea officer. After all everything about the mission depends on Captain and on you as a second in charge of this ship.

Officer : Hmm....

Riya : But Officer, being climatologist, I can analyse the climatic conditions and definitely can predict the forecast for next few days correctly. This will surely help us in completing our mission successfully.

Officer : Yes, Riya. You are providing great inputs to us. I always appreciate and praise the work of weather scientist. It's a tough job.

Riya : Yes, Officer. It's really a tough job, because nature does not have any boundaries. A disturbance in the sea or ocean at thousands of kilometre away from us can affect the weather here.

Officer : Ohhh, really?

Riya : Yes. In fact, the ocean plays a fundamental role in shaping the climate zones that we see on land and its obvious also....

Officer : How?

Riya : It's because more than 70 percent of the earth's surface is occupied by oceans. Therefore, it is obvious that oceans absorb about three fourths of the solar energy that strikes Earth.

Officer : Yaa...logical!

Riya : In addition, water has a high heat capacity, which means it heats up slowly and it also cools off slowly.

Officer : Yes!

Riya : Remember also that heat flows from areas at higher temperature to areas at lower temperature. During the day, water is usually at a lower temperature than surrounding land and air, so energy is transferred to the water. At night, water is often warmer than its surroundings, but energy is transferred away from the water slowly because water cools off slowly.

Officer : (laughing) That I know, Riya. Being Chief officer of the ship, that much I must know.

Riya : Sorry Officer, I did not want you to underestimate; but....

Officer : No...No, but let me complete the story now. When ocean temperatures are warmer than air temperatures, the ocean heats the air above it and nearby land areas by conduction, convection, and radiation. Significant amounts of energy stored in the ocean can be carried inland by sea breezes. Am I correct, Riya?

Riya : Yes, absolutely Sir, but the story is not yet complete!

Officer : Ohhh...Come on Riya! Now you complete the story, but let me take another cup of tea now. I will make one for you also.

(Officer prepares tea for both. Sound of cups and spoons; pouring of tea etc. on the background)

Riya : Thanks Officer! The ocean doesn't just absorb solar radiation; it also helps to distribute heat around the globe. Ocean water is constantly evaporating, increasing the temperature and humidity of the surrounding air to form rain and storms that are then carried by trade winds, often vast distances.

Officer : Yes, in fact, almost all rain that falls on land starts off in the ocean.

Riya : And the tropical areas are particularly rainy because heat absorption, and thus ocean evaporation, is highest in this area. Outside of Earth's equatorial areas, weather patterns are driven largely by ocean currents.

Officer : Ocean currents! That's interesting and something which is very much related to my domain.

Riya : Currents are nothing but movements of ocean water in a continuous flow, created largely by surface winds; but also partly by temperature and salinity gradients, Earth's rotation, and tides. Major current systems typically flow clockwise in the northern hemisphere and counter clockwise in the southern hemisphere, in circular patterns that often trace the coastlines.

Officer : But what is the significance of these ocean currents to us?

Riya : Good question, Officer! Ocean currents act much like a conveyer belt. They transport warm water and precipitation from the equator toward the poles and cold water from the poles back to the tropics.

Officer : So Riya, you mean to say these water currents only regulate global climate?

Riya : Yes Officer. You got my point! These ocean currents help to counteract the uneven distribution of solar radiation reaching Earth's surface. Without ocean currents, regional temperatures would be more extreme—super hot at the equator and frigid toward the poles—and much less of Earth's land would be habitable.

Officer : Ohhh... It means these oceans are playing important role in the survival of living organisms on the Earth!

Riya : Yes. Certainly!

(The Captain of the ship comes to them)

Riya : *(In low voice)* Ohh, Captain!

(Riya and Officer leave their chairs stand to give respect to the Captain. Relevant sounds of pushing chairs back and sounds of shoes should be given to generate the effect)

Captain : Sit down. In fact, Riya I was searching you.

Riya : Why Sir?

Captain : Riya, I want to discuss with you regarding our next plan.... and it's good that Officer is also present here.

Officer : Yes, Captain!

Captain : Now listen to me carefully. I received the information from GPRS that the weather conditions ahead are not so good.

Riya : But that was predicted Captain. Because we are now in the zone of El Nino and ...

Captain : Yes, Riya that's your job... but I have to sail the ship safely through this ocean. And obviously, I need your help. Now you go through your charts again and mark all possible alternatives available for us. We can even change our route or even ask permission for the halt somewhere...

Riya : Yes, Captain. The charts are with me...right now. See... **(Riya opens the charts. Sound of papers is heard on the background)** As far as I guess, right now we are here... heading towards eastern Pacific...

Captain : Yes!

Riya : Now, El Nino will be effective from this region....here, which I have marked in red colour...

Officer : Sorry to interrupt, but what is this El Nino? And why are you worried so much about it?

Riya : Actually, 'El Nino' is the weak warm ocean current that rans southwards along the coast of Peru and Ecuador at about Christmas time. In fact the word El Nino is from Spanish language and in Spanish it means 'child Christ'. Since the effect is observed at about Christmas time, it is named liked that.

Captain : Ohhh... I was not knowing that!

Riya : An early recorded mention of the term 'El Nino' to refer to climate occurred in 1892, when Captain Camilo Carrillo told the geographical society congress in Lima that Peruvian sailors named the warm north-flowing current "El Niño" because it was most noticeable around Christmas. El Nino is as real as other weather phenomena: thunderstorms, for instance. But the only difference is that we have a very good idea what triggers thunderstorms, what conditions make it likely for them to occur, to the point where weather forecast models commonly pinpoint the locations and predicted severity of thunderstorms a day or so in advance. However, we do not have such knowledge for El Nino.

Officer : Then how can we predict?

Riya : Once an El Nino has started, we have reasonably good skill in predicting the subsequent evolution over the next 6-9 months, but before it has started we have very little skill in predicting the onset before the event has become obvious. There are a variety of theories for why El Nino start, but none of them has given us real skill in making a forecast in advance, the way we can for thunderstorms.

Captain : But Riya... now it has started.... So we have to predict the weather conditions!

Riya : Yes, Captain. Surely!

Officer : Riya, what is the significance of this El Nino? Is it dangerous?

Riya : The warming of the ocean surface above-average temperatures in either the central and eastern tropical Pacific ocean causes a shift in the atmospheric circulation with rainfall becoming reduced over Indonesia and Australia, while rainfall and tropical cyclone formation increases over the tropical Pacific Ocean.

Officer : Is there any effect of El Nino on our Indian climatic condition?

Riya : Yes, certainly. It is found that, when El Nino occurs, monsoon in our country reduces. We may even face drought.

Officer : And what's about cyclones?

Captain : That's what I am worried about, Officer!

Riya : Research carried out in last three decades say that, the ocean's surface waters will be hotter than usual in the Western Pacific because of global warming, resulting in more frequent cyclones during El Nino. There is a link between ocean surface temperatures and tropical storm intensity – warmer waters fuel more energetic storms.

Officer : Ohhhh....my god!

Captain : In fact we were late for the mission. We would have done well in earlier where there was La Nina!

Officer : La Ninaaa? What's that?

Riya : It's exactly opposite effect that of El Nino. *(Laughs and says)* In fact La Nina means 'sister' of El Nino! It is the positive phase of the El Nino Southern Oscillation and is

associated with cooler-than-average sea surface temperatures in the central and eastern tropical Pacific Ocean.

Officer : Is it favourable?

Riya : For us.... Yes! It is found that, whenever La Nina occurred, we had a very good monsoon! But, it causes draughts at some other places. It causes hurricanes in Atlantic.

Captain : One thing you remember, Officer... these effects affect the weather patterns... somewhere on the globe they bring good effects, but obviously at the other side of the globe we see their ill effects. After all, temperature rise causes pressure difference and that leads to winds, storms, cyclones, rains... and so on.

Riya : Absolutely Captain! When El Nino occurs, pressure over Pacific Ocean decreases due to hot water currents, but due to this pressure over Indian Ocean increases. This effect is called as 'Southern Oscillation'. The two effects come together and hence it is commonly known as ENSO (एन्सो) effect.

Captain : Okay Riya.... Now it's time to work on this effect. Otherwise, the mission –

Riya : No.... Don't worry Captain! We know how to tackle... Let's hope for the best and fight!

Officer : Yes Captain! We'll do our best!

(The scene ends with a sound of strong winds of storm and waves of sea. Also, sound of shouting people on the ship is heard. They are trying hard against the storm and trying hard to sail safely. On this background Molu is dreaming and shouting in the sleep)

Molu : Come on Captain! Hold on! Officer.... Riya... help captain....

(Grandma comes in)

Grandma : Beta Molu, what happened to you? Who is Captain? Riya? To whom you are calling?

Molu : ***(Still in sleep)*** Hold on Captain. You can do it.....

Grandma : Wake up Molu....It's 8 o'clock now. And it seems you were dreaming...

Molu : ***(Wakes up)*** Umm.... Yes, Grandma. It was –

Grandma : Who was Riya, Officer? And Captain? Are you playing a cricket match or what?

Molu : Nooo... Grandma! It was a huge ship and Captain was fighting hard against the cyclone to save the ship...

Grandma : Come on Molu... It's a dream. Remember what you told about Noha's story yesterday?

Molu : Grandma, it might be the myth, but whatever I have seen in the dream is a truth...water current... Ocean as a heat sinks... climate change... El Nino

Grandma : Okay Molu. I don't understand what you are saying, but now you are talking like Noha now, ***(laughs)*** that's what I understood!

Molu : Come on Grandma. Don't make fun of my dream. I will check this information on internet and I am sure that, all the listeners who are listening this story will also check and try to know more about all this!

(Music piece. Episode ends.)

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