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**Research article**

# Eco-friendly, Modification of Severe Tropical Cyclone: Towards Social Welfare Technology

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## Abstract

Depressions and deep depressions harbringes bounty. Tropical cyclones have a tendency to intensify and inflict wanton loss. India suffers incessantly. She has the means, and has no method to down-regulate killer / destructive cyclones. An eco-friendly theory is discussed. It uses thermal power plant fly ash and or activated charcoal as seed, dropped in form top at designate locations. Cloud feeder channels be the best sites. Aim is to disrupt principal energy input mechanism (stochastic pathway), make the front non-synchronous.

**Keywords:** Cyclones; Fly ash; Feeder channel; Down regulation; Up-regulation,

## Introduction

Very severe cyclones are geography specific. The india Meteorology Department (IMD) classifies various sea sourced cyclonic systems as in Table-1 (Dastidar,2000). In 2006, India had 16 Cyclones and depressions of synoptic scale, of which 14 had crossed the Odisa coast line (IMD,2006). In 2013, India had 10 cyclones over north Indian

Ocean, 1deep depression over the Arabian Sea, 1 land depression and 8 cyclones over Bay of Bengal i.e., BoB (IMD,2014). The Brahmani-Mahanadi delta, Odisa receives excess rainfall agro-meteorologically bracketed between July-Sep. Further, annually, 3-15 depressions and 1-2 severe cyclones cross Odisha's coastline shedding 231Billion$M^3$ rain/yr., between 1$^{st}$July–30$^{th}$Sep., of which, run-off to the sea is of the order 200 Billion $M^3$/yr. Spring tide ingression is between 50-100Kms., inland, with short inter-tidal zones (0.25-1mt amplitudue). Storm assisted tidal bores ranging between 2-20m high are also experienced (Bhattacharya,2011a). Hydrologically, large number of drainages with large cross sections are naturally warranted to drain such large volume spurt flow. Hence Odisa is the ideal candidate for the caption studies.

**Table 1. IMD's Classification of sea sourced weather events.**

| **Category** | **Nomenclature** | **Wind Speed (**knots**)** | **Close Isobars** |
|---|---|---|---|
| 1 | Low Pressure | <17 | 1 |
| 2 | Depression | 17-27 | 2 |
| 3 | Deep Depression | 28-33 | 3 |
| 4 | Cyclone | 34-47 | 4-7 |
| 5 | Severe Cyclone | 48-63 | 8-10 |
| 6 | Very Severe Cyclone | 64-119 | 11-39 |
| 7 | Super Cyclone | >120 | >40 |

**For Land Tornados, the IMD is yet to finalise. India has either types.**

Fig.-1 is the satellite image in the visible range of the Brahmani-Mahanadi delta; exposed in non rainy season (got from Google Earth, with thanks). We can see that the entire region is a maze of drains and channels of various cross sections; remnants included. All being dry. We have compared the same with other large delta(s) viz., Amazon; Mississippi; Rhine; Danube; Leena; Ob; Yellow; Mekong; Padma (Ganga-Brahmaputra combined); Indus; Congo. We confirm, that geographically and geomorphologically excepting the Padma delta, non of the afore mentioned deltas/command areas have anything alike. Therefore, if severe cyclones and above categories could be down-regulated to <4 close isobars pre ingression into this region, then copious rainfall (that is associated with systems) could be stored in these channels with lot much good for the sub-populations on the ground.

Seasonally, the drainages fall dry during the 8months long no-rain season. Figure-1 is exposed in dry period. To the informed beholder it conjures an impression of riparian country (Odra desa, in Prakrit-Sanskrit lingua). The frequency of cyclone land fall in this domain is so regular that the native coastal people have indigenous cyclone resistant rural house building know-how (Bhattacharya, 2011b). This coastal domain and most locations in the north-east India have an annual average rain fall of the order 1500mm. Some of the plateaus (Koraput; Kandhamal; Similipal; Jharkhand; Sikkim; Meghalaya) have an annual average rain fall of the order 1800mm (Panigrahi, et.al., 2010). A sever cyclone can (additionally) unload anything between 20-40 BillionM3 of water in a span of 24hours spread over a 400Km2 rectangular catchment zone in the inter-valleys of these plateaus. Wind velocity bring in

another set of (insurmountable) problems for the afflicted natives and the administrations. This apart, the eastern shore board of India is also the focus region for Govt. of India's flag ship research program termed 'STORM (IMD-STORM, 2012). Storms are very intense cyclones of small cross section (meso scale). Bhattacharya (2006a) and Bhattacharya & Misra (2013) have pioneered a study as to how sever cyclones and intense storms (micro-bursts) cause acute problems for the pregnant, the heart & lung diseased patients and for the geriatric group. Bhattacharya (2015) has discussed the nexus between meteorology & malaria in the BoB rim. Bhattacharya, et.al., (2011) have reported that the same geography also experiences Tornados (micro scale) which makes our domain as singular on pan global basis. Therefore, there is a need for killer/destructive cyclone down-regulation technology. It will lead to standardization of storm down regulation technology, by & by.

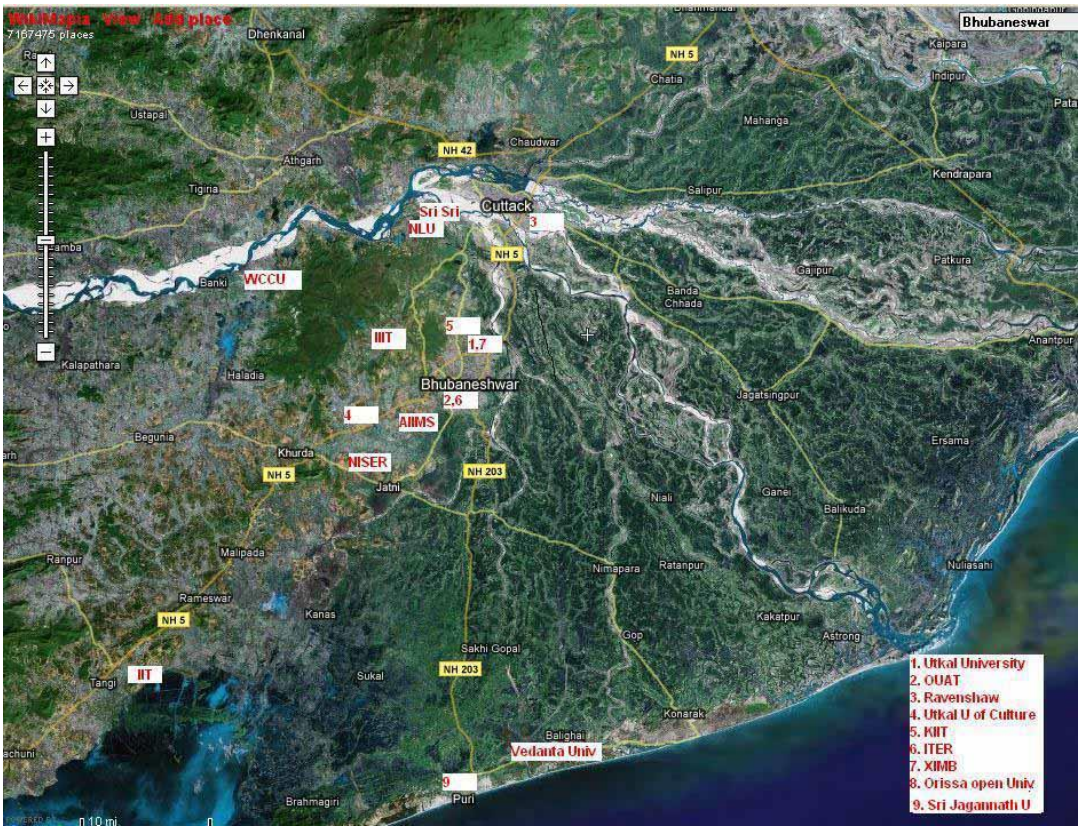


**Fig. 1 : Is the satellite image, downloaded from Google earth with thanks. It shows the Mahanadi Delta in the visible range.**

Following Bhattacharya (2003), Alamaro et.al., (Alamaro,2006), had proposed a ultra expensive and cumbersome technique of upward spraying of sea water by 'compressible free jets' from ships located around a cyclone with a aim to induce *enthalpy* all around the periphery and down regulate it, which was later found to be untenable (he followed Bhattacharya on *datum*). As run up to these treaties Bhattacharya a native of the Super Cyclone (10-1999, Odisha, India) effected zone had as usual gone out to study the same and survived miraculously (supporting information). He has discussed the correlation between geo-spatial & meteorological aspects (Bhattacharya,2006b) and the mechanics of the Super Cyclone using principles of fluid mechanics (Bhattacharya, 2006c) and also discuss the causative factors of high gyration in the tropical cyclones germinating in the Bay of Bengal (BoB); the weak points of the Super Cyclone –1999/structure. He dealt upon the meteorological physics in a International conference

of multidisciplinary scholars of weather modification (Bhattacharya,2007a), and presented (*via* poster) the fly ash (FA) to be an very effective cum economic candidate aerosol that could be used for down regulating killer cyclones by top seeding and also discussed the mechanics of down-regulation. Bhattacharya (Bhattacharya,2007b), again by a lead oral presentation at the International Conference of Asia Ocenia Geo-Science presented the physics and the mechanics of 'Eco-friendly (limited) down-regulation'- using 'fly ash' as the aerosol/CCN. D. Rosenfield, et.al., (2007) followed by discussing the history of failed theories and proposed a sidereal seeding with sub-micron hygroscopic aerosols, without mentioning any candidate (aerosol) in particular.

## Natural Preferences

Hill/precipe type orography as is the western ghats of the Indian peninsula and the Rocky mountain chain of the north American continent develop (compressed) fluid boundaries which deflect; thwart land fall and inland ingression. The delta valley geographies such as that of belly China; Ganga-Padma-Rupnarayan region, Brahmani-Mahanadi region, and Godavari regions of the Indian sub-continent permit land fall; on-land life and inland ingression. This is due to their unique orography. Long on-land life is the principal cause of destruction of precious property, human & veterinary life. Therefore, geography, orography, geomorphology and also aerosols posits as vital cause factors in appreciating the causes of intensification, on-land life, down-regulation, decay deflection and path alterations.

In this communication we discuss the (possible) multi-disciplinary role of the Indian Air Force/Indian Navy, the remote sensing & met scientists can in real-time play in the attainment of such socio-strategic objectives. We are further of the view that sidereal seeding of cyclones by micronised hygroscopic material i.e. warm CCN (Rosenfield's method) will be sucked near uniformly into the lower and mid circulatory (dynamic zone) and result in quick evolution of crisp boundary phenomena; high gyration; high 'T' factor; robust stem; erect architecture; forward motion; intense cloud to ground arching; heavy load shedding all over the system; synchronised front; increase in 'H' dimension (will result in stoachaisation on planetary scale = disaster as in SC-10/999) and/or even induce straight track (swift land-fall ~ reduce reaction time). The system will gain in enthalpy and enstrophy. Its energy basket will fold rise; ability to withstand ultra high solid state bottom friction (land) will leap frog resulting in longer duration effective on land life (actual killer/destruction period). Hence our theory needs detailed discussion.

Figure-2a is on a geography map. It shows schematically the Indian peninsula and the BoB rim as a pair of near complementing triangles. Hence, either can be fractralised using Sierpinski*'s* model, which is a tool in (i) size function (ii) thrust function studies (iii) angle vector. The in-sea lower triangle marks the genesis domain of atmospheric weather systems of the vortical form and initial direction of incidence (March-Sep., period). The small triangle (northern BoB) marks the zone of the compressed forcings transpiring out of the stepped-down architecture of the triangular morphology (fractal effect) and as the natural preferred domain for genesis of anti-clock spirals. Figure-2b has a line (A-B) drawn from the Sikkim plateau to the Arakans (through Meghalaya plateau & Cachar plains). The term 'cachar' is phonetically pronounced as 'kachar' (muddy in local lingua). So this plain is a descriptive geographic term as alike the Flushing meadows of the British Isles. Figure-2c is the schematic cross section of the geomorphology along the line A-B. The corner apex (viewer's left) being the Himalayas→ Sikkim→Brahmaputra valley→ Meghalaya→ Kachar plains →Arakan hills. Fig.-2d shows the fractalization of monsoon's hydrodynamic thrust – in 3D as enmeshed members.

In Figure-3 is the line 2-3. It is that of the schematically drawn monsoon trough as during *cold SST* year - originating at sea (BoB), ingression through the Mahanadi-Brahmani -Rupnarayan delta-valley drainages (preferred

gateway) and extending past New Delhi. At its sea end is a boxed domain that marks the locus of genesis of deep systems and high gyration.

Along line 2-3 are 3 transverse lines that have been drawn at 3 different geo-locations to arrive at the barotropic architecture of the cross sections at 'A-B', 'C-D', & 'E-F', of the atmospheric trough (also known as 'monsoon trough'). They indicate the depth and the width aspects which is inverse at locations away from the sea. This provides the pathway for initial ingression. And whereas, the geomorphology of the river valleys offer a similar physical architecture with altered sequence (as in cross sections A-B, C-D, & E-F) at variable elevations from MSL. This is the principle cause of [i] heightened friction (drag due solid state bottom) [ii] systems remaining stationary on coastal plains and decay. Thus, systems fail to negotiate the central Indian high-lands (heavy ones stay put in coastal regions). If we have a technology to up-regulate such systems then copious precipitation can be induced in the Ganga-Yamuna agro belts and specially in the rain shadow regions during monsoon. Such type of weather modification will help bounty & family welfare.

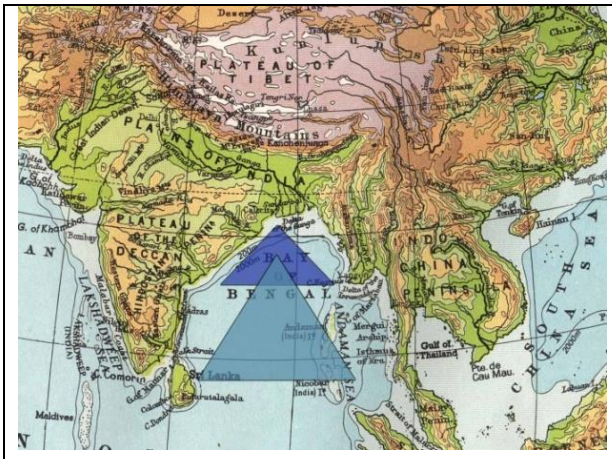


**Fig. 2 a.**

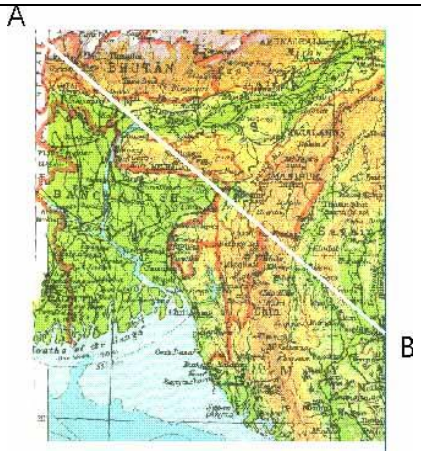


**Fig. 2 b.**

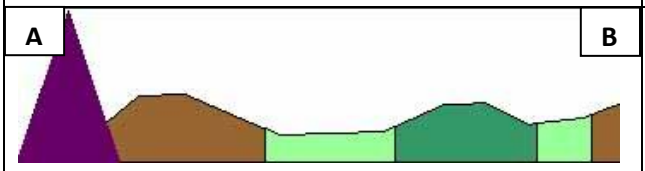


**Fig. 2 c.**

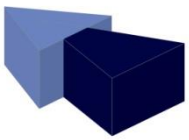

**Fig. 2 d**

**Fig. 2 series: explained in detail in the following paragraph. □□Fig-2d in particular shows effect of the triangular architecture of the BoB in the initiation and propulsion of the horizontal component of the sea-atmosphere couple during monsoon in the BoB. It is alike Serisprinsky's fractals. Orography & Pacific factor jointly swivel thrust.**

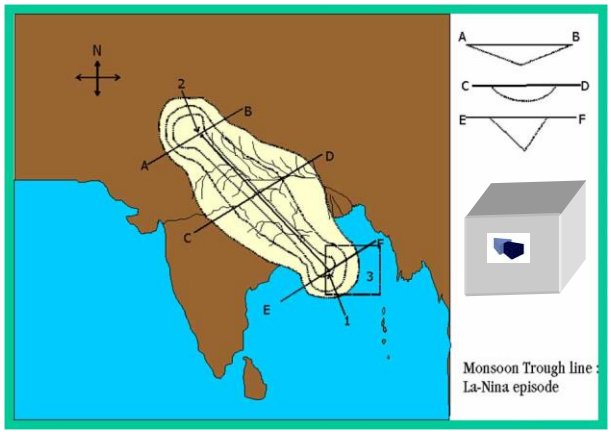


**Fig.-3. shows the ideal trough of the Indian monsoon with schematic cross sections of the trough and the angle of the hydro-dynamic thrust of the ocean-atmosphere couple.**

On the other side, the Himalayan ultra high rise chain geomorphology that rises above the meteorological boundary layer (~ 900-1000mts above MSL) is closest (Sikkim plateau) to the BoB. Jointly with the Arakans it locks the Bangla-Brahmaputra plains with the southern precipitous face of the Shilliong plateau jutting in the middle as alike an axle facing the BoB. Circular flow around it creates additional (atypical) met domain which in turn reduces back pressure in the boxed region as in Figure-3. Such compaction of fluid with reduction of domain promotes genesis of systems in series circular flow; spiral form & swivel towards the eastern shore board of India (in compliant conditions). The copular thrust of the sea-atmosphere (in parts) gets locked in the valley-plains of the NE. Their synclines i.e., the solid state boundaries produce fluid boundary effect of various dynamic orders (couple thrust dependant), which becauses swivel of the lines of the forcings as per the lie of the solid state boundary (Arakan-Himalayan geomorphology) in tune with Coriolis. Such sea-atmosphere couplar thrust (monsoon south-east branch) takes on a supine pyramidal form and its swivel is schematically shown in (inset F-3). Hydro dynamic compression becuases size reduction. Orography induces swivel towards the zone of least resistance (the deltas). Variable swivel permits a wider land-fall domain & subsequent events. This is the cause of the eastern shore board of the Indian sub-continent acting as the most preferred destination of atmospheric weather systems i.e., sea sourced cyclones; land sourced tornados and in the shifting of the monsoon trough line (thrust dependant). The western shore board of India experiences not all these primarily due orography & geomorphology inspite of being triangular. Hence, severe weather event caused social & national losses will keep on occurring all along the eastern shore board of the Indian sub-continent. In this paper we present the basic skeleton of a (detailed) hypothesis to develop a home grown technology to (i) down regulate destructive cyclones (ii) up-regulate weak ones (iii) inflict ingression potential. On pan global basis, this is a 1$^{st}$ time work. It is backed by two decades of on-foot, field work; a decade of academic co-relationing and preparatory run-up.

## Super Cyclone 1999 : Observations & Discussion

Fig.-4a is that of the Super Cyclone of 1999, at location landfall (NOAA,2003). It may be co-read with T-1. Fig.-4b is the outline of that system along with the inter-hemispheric long FC which is of planetary scale. It describes the yo-yo cum wave type form (zenithal view). Fig.-4c schematically incorporates the overall wind cum moisture flow and marks out few typical aspects that are associated with destructive cyclones. Around the eye is the CZ (core zone). Around it is another moderately high circulatory wind zone extending laterally beyond the circulatories having destructive force. It too is circular being hooded by depleted cloud marked as CH (cloud hood). Thereafter,

is the down-draft zone marked by clear sky. The CH is the outer rim of the circulatories. It is bereft of rain and is a collinear cum supplementary mechanism. In other words, in frictionless or in near frictionless conditions, objects/particles having similar mass will develop in-field copulations having uni-directional flow i.e., fields of static inertia will gradually become dynamic (enlarge). Such copulation will be interactive and have size; mass; & therm based stratifications. The CZ & the CH are a complementing couple.

The oval ring represents the field in which strong, laminar, cool surface breeze that was noted (wind vane based) to be flowing in the direction of the CZ alias 'surface in-flows' (SIF). The tip of the oval is the farthest point from 'E'. It is co-incident with the direction of inclination of the system; the 'F', and the track. SIF is a thin, compressed fluid bed having centripetal flow marked by arrows. Deep systems float on SIF fluid beds which also supplements the radiator component of the system, apart being the source of the updraft. If solid state friction from geomorphology be high then SIF will be weak & inconsistent. Stronger and consistent the SIF, erect be the central column; high be the wind velocity in the CZ with a more synergic 'F', respectively. Our experience is that if the SIF has 10knots speed being consistent over a terrestrial field of 100kms for >3hrs it means the system is intensifying beyond 7 close isobars. There is a direct relationship between the length dimension of the oval architecture & the number of close isobars. Longer be the cross section of the field of the SIF (G-D axis) stable and long duration will that system be i.e., will withstand longer period of solid state bottom friction (on ground longer life). Systems develop destructive potential if all the conditions are *in*-situ. Thus the SC-1999 could have a near stationary on ground life of >24hrs. In Fig.-4c, position PC in the FC is the locus of 'parcel cloud' racing towards position TC →CO. These are pre tor type cloud masses. Beyond position CO until the principle energy injection point (EIP at B1) the FC is compact with tor/ribbed type cloud having large length dimension as compared to breadth. It is also the zone of very high Reynolds up-till the EIP.

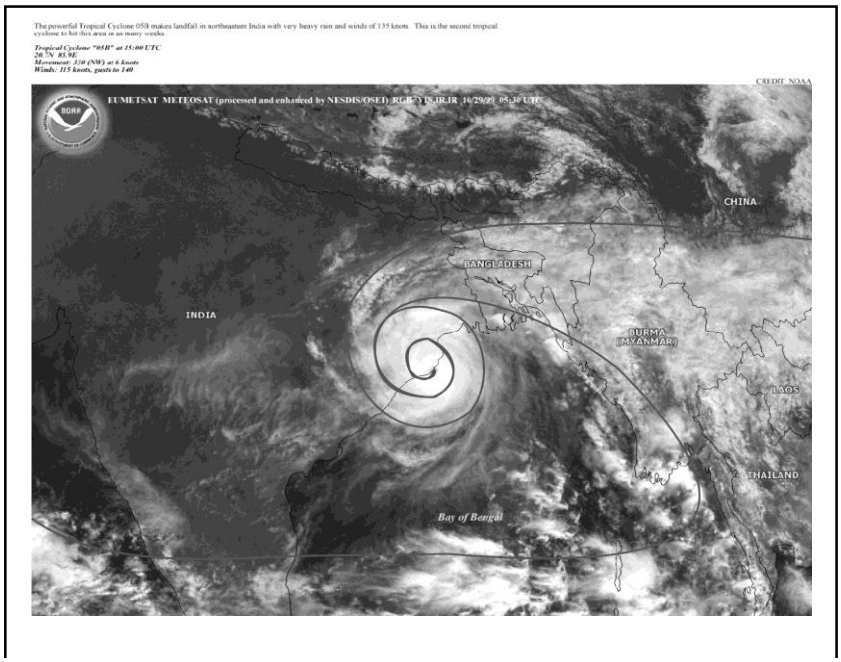


**Fig-4a is that of the Sc-1999, at time land fall. Outline has been provided indicating the electrostatic boundaries of the cloud/moisture feeder channel.**

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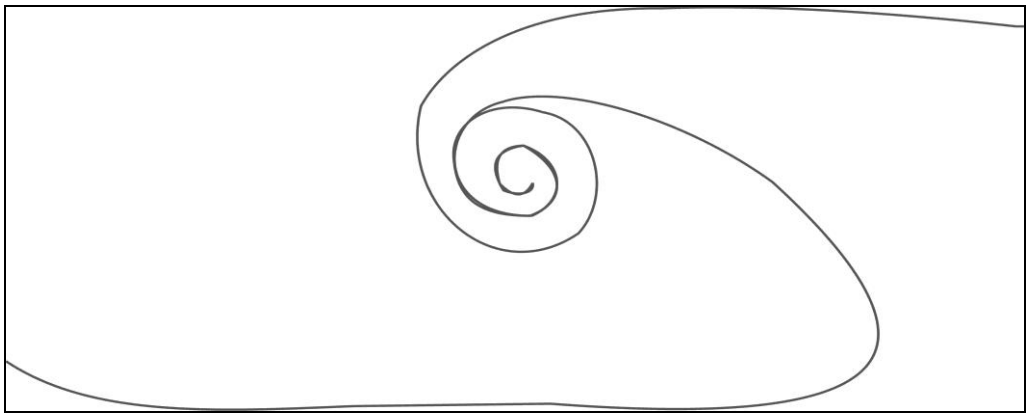
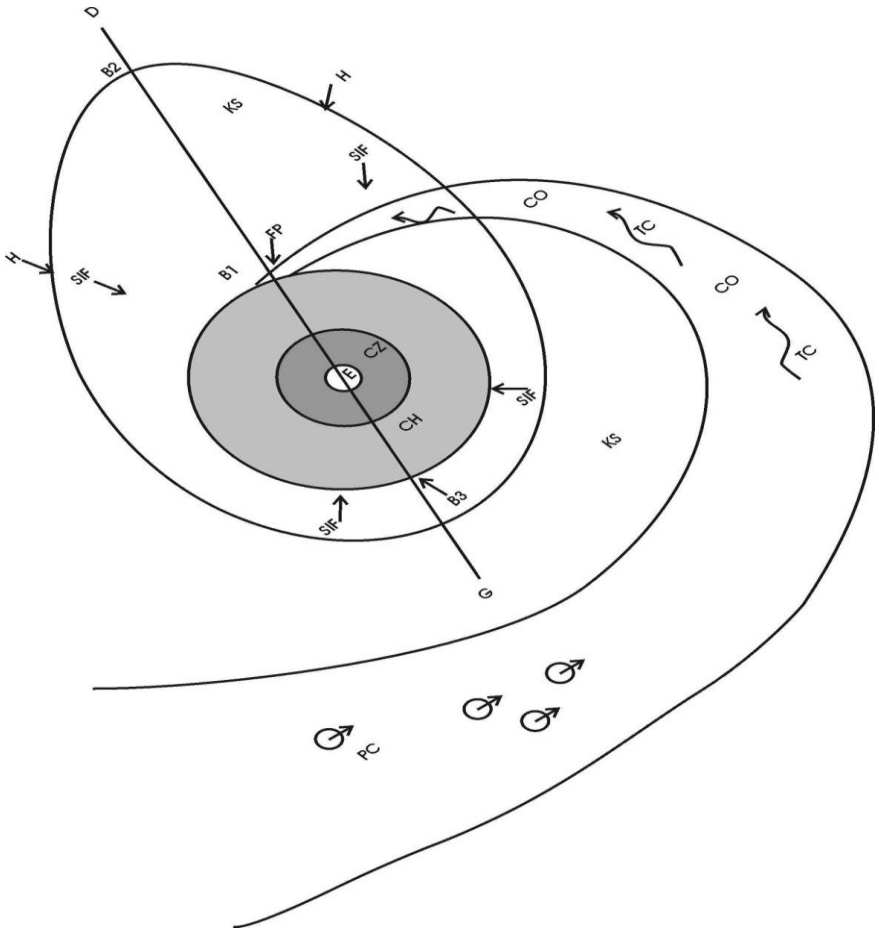


**Fig.4b shows the yo-yo form. Energy conservation is around the Eye.**




INDEX : *E-eye; CZ-core zone; CH-cloud hood; B1-front; FP-feeder principle; B2-farthest effect point; D-destination; B3-rear; G-genesis point; KS-clear sky; SIF-surface in-flows; H-high pressure; CO-firm electrostatic boundary; TC-tor cloud; PC-parcel cloud.*

**Fig.- F-4c. Shows the architecture and the field of wind and moisture flow, the cloud feeder channel, the oval SIF zone, the CH & the core zone. It is schematic, zenithal view. Indicates the various positions. Also indicates location for seeding to up-regulate intensity cum carrying capacity and to inflict greater ingression potential (selectively) into the systems. See text.**

The FC is also the prime energy feeder and the EIP is its delivery point. The FC is inclined in a screw cum spiral path bounded on either side by electrostatic conditions which causes crisp boundary phenomena, which complements the spiral architecture. In other words, a synergic 'F' will induce higher rotational speed and crisp boundaries (reciprocal). In free atmosphere the FC also acts as a balancing boom for the rotating screw. FC's length & central column's erectness are also reciprocal. Region KS denotes 'clear sky', and coincides as high pressure zone; high column thrust & high speed cool down draft (another part of the aberrations). Fig.-4c can also be generated as a real-time projection from primary met-data obtained from field systems (single station modules/modern).

## Phailin – Observations & Discussions

The Phailin struck the same shore board after an interval of 13yrs. Having landfall 200kms to the south along the beach. It too wrought havoc. We may discuss the observations (related to this transaction).

A cyclonic circulation i.e., a low pressure area over BoB had germinated to the east of the Tenasserim coast on 6th October 2013. It graduated to a well marked low pressure area on 7-10-2013 in the north Andaman Sea. Then concentrated into a depression in the same domain. Interestingly, a perfect track and the exact locus of landfall was announced (constituency of the CM & RM -Odisa). The system intensified into a deep depression on 9$^{th}$ morning and then into cyclonic storm (CS) with the call name 'PHAILIN' in the same evening. It further intensified into a severe cyclonic storm (SCS) in the morning and into a VSCS in the forenoon of 10$^{th}$ Oct. It had landfall off Chatrapur-Argipalli coast (Ganjam), around 17:00 hrs UTC of 12$^{th}$ October 2013 (dot time image not available to us) with a sustained maximum surface wind speed of 220 kmph (micro-bursts having higher) and an estimated central core pressure of 940 hPa i.e., a drop of 66hPa. The SC-1999 had an estimated core pressure of 926hPa. Labor at primigravidae (1$^{st}$ child delivery) requires a thrust of 75hPa (see Bhattacharya, et.al., 2006a; 2013). Phailin had generated a maximum storm surge of 2.5 meters with inland ingression of 1kms and Ganjam has a high coast line, steep shore (+ coastal sand bar); the annual average tidal amplitude being 50cms. There was state wide heavy rainfall cumulative being 30-38cm maximum in 24hr period. Ganjam is the granary of Odisa, It was harvest season. There was never before like loss.

The Special Relief Commissioner (Mr. P.K.Mahapatra) to The Govt. of Odisa in a Conference in the presence of the Chief Secretary Odisa, & the DG-IMD informed the press & the public that the Director, IMD, Odisa Centre-Bhubaneswar had informed him on 4$^{th}$ Oct about a possible genesis having some Bangkok connection (SRC,2014).

Figure-5a is of dt., 10-10-2013, 18-00 UTC. A mini circle is noted off the coast of Saurastra. It suggests seeding by aircrafts with an aim to modify the weather. Phailin was inclined towards Myanmar (Tenasrim). Moon was co-incident. Apart the warm sea sourced FC, there was also additional cold moisture as potent feed from the Himalayas.

Image series as in the archive in between 5a & 5b of the Phailin shows suggestive seeding along the FC (at sporadic locations) with concurrent down regulation, eye dissipation and systemic list towards mid-central BoB. Moon remaining co-incident.

Figure-5b is of 11-10-13 at 21-00 UTC. It shows a large parabole (a weather system) floating towards the system – as the signature of the weather modification seed-feed. The system had non-crisp boundaries, and a seaward list, with re-intensification signs. The feeder channel being not as large nor as loaded as that of the SC of 1999. Moon was co-incident. Apart the warm sea sourced FC. The additional cold moisture feed from the Himalayas showing signs of decay/weakening.

Figure-5c is of dt., 12-10-2013, 00-00 UTC. There is again circular seeding exercise (or a weather system) done in the NW India-Pakistan region. The ends of the contrail do not match due to size-time (south-east ward flotation) aspect. Due availability of good CCNs in bolus the system has corrected its list. Has hugely re-intensified. Only warm sea sourced FC is existent. The cold feeder moisture feed from the Himalayas got terminated automatically (only because carbon the choice CCN was made available).

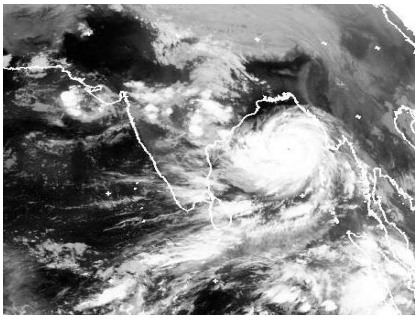


**Fig-5 a**

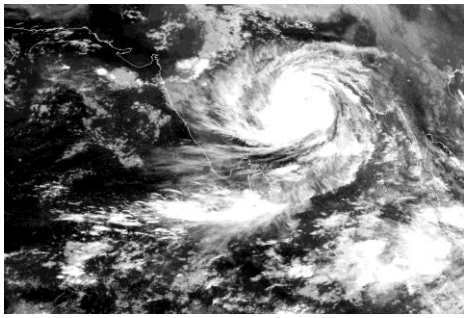


**Fig-5 b**

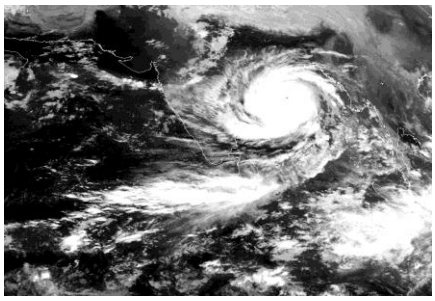


**Fig-5 c**

**Fig-5 series shows suspected seeding operations to intensify cyclone Phailin. This is our theory and is not borrowed from any source.**

In boundary-less, friction-less conditions one weather system do not sail towards another either forming opposite arcs. This is because gases that comprise weather systems are quite compressible and undergo continuous collation-dissipation mechanics. In Fig-5c since they do so (ranging over a domain of sub-continent wide) it suggest that the parabolic arcs are CCN loaded of a uniform type in a uniform manner. Figure-5a-to-5c evidences such phenomena.

Again an atmospheric cold feeder is also best aspected by CCNs having warm property. Confluence of warm & cold fluid beds results in super elevations (up-regulation). Our study evidences such phenomena, too. We are of the considered view that up-regulation exercises were possibly done with Phailin for the IR signatures matches the scheme that we have been talking about in various foras & forums during the last decade as run up to this communication (ellaborated herein below). All images are in IR range of 10.5-12.5µm with Meteosat camera position at $57^0$E, Geostationary, curtsey Dundee satellite centre, UK (with thanks).

## The Theory (Down Regulation / Up-Regulation)

In this section we first discuss the hypothesis (Theory) via (i) 'Schematic Description' then discuss (ii) down regulation (iii) up-regulation (iv) infliction of swerve. All this portends harnessing of nature i.e., critical technology.

## Schematic Description

In Fig.6, the system is traversing from the viewer's left towards the right. We have been schematically demonstrating such seeding operation in numerous forums for various regulation objectives, since 2005. It shows a transport aircraft (say Antanov; Hercules), dropping FA (fly ash) over the designate region(s) i.e., PC region in the FC. We recommend propeller type aero-vehicles that can drop and as well mechanically spew using air pressure operated nozzles with the tail wind. Propellers will widen the sprayed field with least mix of turbine fuel (bad CCN). Due the sever cyclonic aberration though bumpy the interior of the FC are quite dense (not rarified as in normal atmospheric conditions). Therefore, wide bodied propeller aircrafts can carry voluminous cargo and be stable platform.

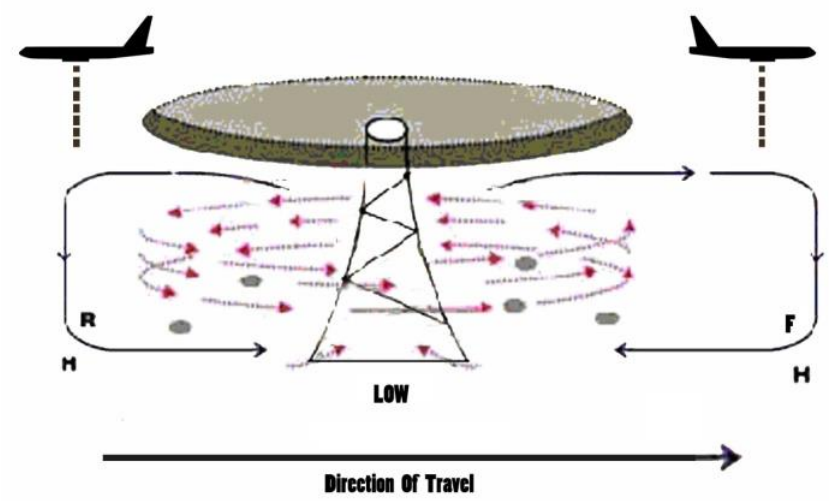



**Fig.- 6 gives the schematic representation of the top seeding operations using AC or FA. R = rear; F=Front; H=High pressure. Seeding in the rear = down regulates. It has to be in the FC region i.e., a little far from the core region. Whereas, seeding affront the F will up-regulate. It has to be in front of the F. The seed material will sail-in and get injected via the SIF. The system will also tend to move in that direction.**

The FA has to be sealed with dry nitrogen gas in poly/latex bags that will balloon at about 700-800hPa in the low pressure field and burst spew. The nitrogen gas will defer the onset of arching by a 'time window' and will allow the crew to take (drilled) evasive actions from the archings because cloud-to-cloud arching is very intense in tropical

weather system (particularly in the eastern shore board of India). Sealing the FA with variably pressurised (as alike hydrosonde balloon) relatively heavier & yet inert nitrogen gas will allow the 'packed-load' variable rates of downward trajectory, explode & scatter at various levels of the column i.e. variable depth charge effect. Explosion can also be assisted by pyrophorics. By adopting the depth charge system our variable objectives can be served depending upon the atypicalites of the individual systems (because no two systems are identical). Meso systems will form and rain down heavily in the hind (of the synoptic system) when seeded in the PC region of the FC. The otherwise firm electro-static side borders will lyse when seeding be done at the outer edges of the FC between location TC & CO. The system will then tend to swerve away from its natural path.

In Fig-6, to the viewer's left i.e., to the rear 'R' of the system the aircraft is conducting seeding operations. It is shown (due to 2 dimensional graph) relatively closer to the Eye. It is thus in the mode of down-regulation and or effecting a swerve. To the viewer's right is the aircraft quite a bit afar from the eye and in fact is also away afar from the 'F'. It is in the mode of up-regulation

## Caution

There will be a natural tendency for such seed material to reach the SIP/F when the seeding is done affront the F or if done anywhere near to the CZ resulting in up-regulation.

## Mechanics of Cyclone Down-regulation

Any weather systems cause clouds which because shade and rain. Wind awakens. Rain is romance. Our theory includes the ability to kill any weather system if it be more-desirable from human and agro-met perspectives. However, we herein intend (only) limitedly down-regulating the efficiency of fluid flow i.e., energy uptake at 'F'. This will lead to desired weakening of any killer system. The crux point of our hypothesis is that a weather system sans an F (front) will lack inland driver potential. Rain is more needed in the interiors. Front energizing and de-energizing technology is warranted. It is critical technology & is warranted.

Cyclones belong to the spiral group of weather systems. Spirals cover wider domain and also have expand-shrink property (due to border less conditions). Shrinking phase is normally associated with compaction, energisation; gain in mass, carrying capacity, up-loading. Expanding is associated with loss of mass; load shedding and decay. They harbinger bounty, provide relief from the scorching-humid conditions. From the perspective of physics, cyclones/tornadoes are thermodynamic-weather systems that even out fronts (anomalies) resulting in barocline equilibrium.

We propose to top seed the feeder channel in the central region of the FC at locus marked PC (Fig.-4c). PC denotes 'parcel clouds', the parcels are semi-convective, in non-conjugated state having wide breath dimension, in rapid forward motion. TC→CO denotes 'tor & compressed', respectively. At locations between TC→CO the PC develop lamination, become elongated (pre tor form), is in accentuated dynamic state with high Reynolds (another part of the aberration). Pre to energy injection point (EIP ; i.e., B1-Fig.4c) the PCs i.e., saturated fluid mass gets ribbed due to compression + speed alias maximum mass in minimum space (yet another aberration in nature). From location to location the cloud masses undergo alterations in shape, size, compaction & speed; do not cause rain; deliver the full laden energy at EIP.

In the BoB the PC region normally ranges between the south →east (meridonially). The TC→CO region is to the north-east & north and the EIP is to north-west & west of any system in relation to the geographical position of the 'E', see Fig-4a & 4c. Such systems make land fall on the Odisa beaches. Systems that will barge into Bangladesh

will have its EIP consistently to the east during the in-sea intensification period and swivel to the N 300-200kms off shore. In the Arabian sea there is a clock wise arc shift by an order of $60^0$-$90^0$s. Only then will the system fjord the Konkan or else have landfall around Alibag. This is due to the spiral architecture and coriolis. BoB system that will barge into Bengal (India) will have its EIP consistently to the NE during the in-sea intensification period. And, Arabian sea system that will barge into the Marakan coasts will have its EIP consistently to the N during the in-sea intensification period.

Our down regulating seed material is *activated charcoal* (AC), and or *fly ash* (FA). Either have a surface area ~2000 $mt^2$/gm, a mesh size ~ 150-200micro meters. It is to be packed in pressurized polypropylene / latex bags in desiccated nitrogen, dropping @ ½ - 1 MT /drop/location. AC initially is hydrophobic for 60-90 seconds (post-burst), → alter ion balance, → weaken side boundaries, → subsequently become hydrophilic (rain zone), → act as CCN (Bosons), → jump start rain drop formation (large sized), → abruptly alter (shrink) the breadth dimension of the FC due conversion of cloud to water , → will reduce mass, → abrupt energy depletion ($H_2O$ will trap heat) at reduced height, → act as Fermion type compounds i.e., biphasic character, → trigger ultra heavy cloud to sea arching, → heightened ion deregulation, → more energy depletion, → result in near creation of a neo axis of vertical turbulence (meso scale), → draw away energy to the rear\sides from the highly energized & radio opaque axial core & the EIP, → peripheral boundary layer failure, → induce up draft & down draft of micro/meso scale, → ($H_2O$) aspect gravity, → form super sized droplets in sea location, → act as a hydro pile (hydroglast opposite of pyroglast) → act as pier against the horizontal flows & dynamic wind balance, → break velocity, → disrupt energy stockisation & inertia, →alter bulk mass modulus & the lines of the hydrostatic thrust, → because internal concoction/wobble, → non synergic 'F', → weakening of crisp boundary conditions. In other words, independent eddies will break out of the FC i.e., evolution of Karnam vortex street (Yuan, 1964) effect. All this will cause back pressure in the energy feed pathways leading to loss of inertia inside the FC, → genesis of gravity wave phenomena, → systemic internal deregulation, → dissipation of eye, etc., i.e., down regulation. Top seeding will induce *enthalpy* of high magnitude in a limited region within the system (apart the central column), which is in contrast to the natural scheme of an efficient mono EIP with a mono axle (core lumen) which is the highway of enstrophy. Creation of at-sea hydropile & hydroglasts (ultra cloud bursts) is the objective of our mechanics. Inducing poly nodes of enthalphy is the crux physics of our said mechanics. For systems that have dual feeders such theory holds good, as well.

Particulates are non symmetrical. As the particulate absorbs moisture shear cracking and poly splitting will happen. This will result in the formation of more number of large droplets more swiftly as compared to pure CCNs (atomized particles have to go thorough collation mechanics of longer duration, will also tend to sail further – more lateral shift). Condensation and collation are associated with lapse rate. Interestingly, the lapse rate is low with higher T-factor. In other words greater the T factor lower is the lapse rate (inverse relationship). When black-&-gray bodied hygroscopic particulates (FA; chimney soot) are used, condensation phenomena is by-passed and collation jump starts. These candidates have dry dispersion and also wet dispersion property. Such be the advantage.

In crass numerical terms the objective is non decaying, limited down regulation maintaining the 'T' factor around No.5 at about 300-200 kms., off shore, through to land-fall then again up-regulate and maneuver the system to sail inland skirting the geomorphic barriers to serve rain fed cum subsistence agriculture, soil \ ground toxin(s) removal & water bodies & water table charging & polluted drainage flushing (viz-Yamuna), etc. Systems, normally undergo (significant) change in a period range of 6hrs. And, in the BoB, historically, systems auto intensify between the range 75-150kms off shore (continental shelf + warm SST + land-breeze flowing over warm, moist, green flora - regions). Thus it is a small window of time & space and shall necessitate overlapping sorties. The seeding therefore

has to be 'abrupt dropping' (bolus) backed by 24 x 7 Doppler imaging & real time co-ordination. Doppler will yield the genesis, locus of the hydropiles and life periods cum yield of the individual hydroglasts.

## Mechanics off Up-regulating of Depressions

Every system experiences *enstrophy* from top. This causes the typical screw type up-draft cum the radio opaque central column with a lumen (akine to the colimela as in zancus pyrum, Fig - 7) and the eye 'E' in any system. Within 'E' the locus of the lowest barometric low is between the mid-centre and the top (not base), point of least resistance cum drag (with an occluded lumen). When the twine aspects combine at the top of the column lumen gets to be clear. The lumen of the 'E' acts as the vent as in a thermodynamic black body. This is also a sort of inversion cum anomaly. Hence, energy as heat (embedded in depleted-to-desiccated clouds) is able to escape due the thermal gradient at great elevation (another aberration). This is the principal pathway of enstrophy. Thus the system does not explode even with sever piston effect generated by the compressing field (centripetal conditions). Note : a met-front is a anomaly alike a shear tear in a fabric. A cyclone (vertical anomaly) is alike a needle-thimble device that becauses rapid equilibrium.

Yet again, the pressure zones; the cool wind; the warm wind and the moisture entrapped energy flow along lines that are oblique to one another are all aberrations. Such is not normal in nature, specially in fair weather. During pendency of weather systems the lines assume a synergistically oblique-to-each-other i.e., angled variously. As if they try to be not infractive nor be tangential (the heterogeneous flow aspect is absent). Synergy in flow gradually builds up – a tendency towards Newton's 1$^{st}$ Law. And, the angle of the curvature of the earth coupled with the geostrophic rotation (spin) provides a two dimensional platform for the curved pathways and obliquity. Spirals conserves energy inefficiently and requires more space, time & force. From work done perspective they are inefficient (winding or energy conservation). Obliquity buts & bounds the a screw type flow (variable depth & width dimensions) within a overall circular perimeter. Therefore, geometrically, obliquity is solely compatible *vis-à-vis* the spiral form as its architecture has a prominent H dimension. And, synergistic obliquity can proceed to subsequent development stages (i.e., stay-put post evolution) when in-&-around the system's centre there is an exhaust route for excess energy escape i.e., enstrophy mechanism (real time signature-1). Our considered view is that the chimney aspect (lumen of the E) is the enstrophy pathway that provides the 3$^{rd}$ dimension in the form of an central column with a lumen. If the geotroph be non-globular and or if there no spin then the spiral architecture cannot form (circular can). If there be no central column then any system with low RPM, having an H dimension with a load cannot sustain more than a few hrs., (will be non starters). Therefore, the spiral is a preferred form.

Fig-7 is the X-Ray (radiographic) image of the zancus pyrum shell (sankha). We can see the spiraling bands in an upward angulation. This is the colimela (central column). We have produced if from Rath & Naik's work (2010) as it explains our case best. We have derived inspiration from such natural being. The pyrum gives us the Fibonacci fractals, which we have also co-related with system intensification steps, apart from deriving the understanding that a system needs 3 dimensions. And, in on-land weather systems retaining the depth dimension (including self priming) is the crux of the problem. The colimela provides the axel for the horizontal and the vertical depth dimension to any gaseous system – which translates as carrying capacity. In other words, in friction-less, boundary-less conditions stochastic pathways seek uniform, acute angle of the curvature which in turn results in intensification (as different from efficiency). That can happen when there be an interactive central column. The horizontal : height depth ratio is another measure/signature of system's intensification possibilities, etc. The range of such ratio being between 1 : 2.5 to 1:1.6. Our field observations is that meso-scale thunderstorm events are associated with heterogeneous flow pathways of the stochastic processes. They do not have mono colimela, often non-distinct – {Fibinacci aspect of cyclone intensification-separate communication}.

**Fig-7 : X-Ray image of the zancus pyrum, Blowing side is at bottom. Note, tapering spiral central column-*Colimela*.**

An efficient EIP at B1 auto mandates high gyration, which means the at ground force of the wind will be destructive for agriculture and horticulture ( & also for river traffic). Moreover, even high rotational speed has thus far not been related to ingression potential. It only results in compaction (gyre i.e., wind velocity) and destructive force. Whereas, our objective is harbinging precipitation sustained over large similar/identical agro-met domains with ground wind conditions of around a T3 system. By studying Doppler images we have noted that the flow pathways in sever systems have 3 principal set of curves viz., $10^0$; $20^0$ & $30^0$s (supporting information). Greater obliquity ($10^0$) is associated with intensity and on ground destruction, while $30^0$ with efficiency, with salubrious conditions. It seems in nature efficiency is a not 'in a haste member'. Therefore, while any system is weak/inefficient wide curvature and/or non-synergistic obliqueness of the associated stochastic process pathways should be the real-time signature No.2. Inflicting/instilling acuteness in such lines will result in the retaining and/or re-instilling efficiency which in turn will impart greater ingression potential and longer life.

In order to up-regulate a weak system (say upregulating from 1 close isobar to between 4 – to – 7 close isobars) and thereby enhance its rain bearing and rain causing capacity and ingression potential the seeding has to be done gradually over extended period (not abrupt - $week^+$ period), over extended zones within the SIF region between position B2→B1, with an theoretically permissible arc shift of $45^0$ on the imaginary oval parabolic SIF arc (Fig.-4c). Flying with the tail wind will scatter yet not disperse nor make it flow along undesiarable/unintended lengths of the seed particulates (each particulate having numerous candidate CCNs), Seeding being at the lowest possible elevations within the meteorological boundary layer. Therefore, the SIF affront the F (B1) will result in systemic conservation of energy more from the direction of the seed/CCN input. The most significant and prominent observable aspect will then be an up-regulation in the ingression potential, precipitation with lessened arching (includes rain & snow).

We know that in the BoB numerous systems of category 1-3 (Table-1) germinate that experience in-sea conjugation → lack of driver potential and decay between 200-300kms off-shore; also dissipate (only cloudy condition – as in June 2014). By such understanding and know-how, systems forming in the north Arabian Sea can also be made to

up-regulate post landfall and ingress into east African arid regions or into the Indo-Pak desert-arid regions and shed the ferried load (monsoon season). Similarly, the BoB systems post ingression onto Maikal ranges & Chota Nagpur plateau can be up-regulated to traverse up the indo-Gangetic plains. Again such systems can be adjuncted by attracting inflows from the Assam valley (via Purnea-Jalpaiguri axis). The unified stream can further be up-regulated at about east-of-Lucknow with an objective of carrying rainable load uptill India's National Capital region. Systems can be made to drive in from Bhubaneswar-towards-Raipur, and again from Alibag-towards-Nagpur. The two seed variants (FA & AC) comes out to us as biphasic candidates having dual technology use in weather modification for socio-economic welfare with the family at heart. Technology should be for (i) family welfare (ii) leaving a laid back life style and not for bogus cum convoluted prosperity for the government.

## Up-regulating weak Meso members

In meso scale thunderstorms the up-draft is the SIF. Rain fail occurs inspite of cloud cover spanning a significant percentage of the Okta primarily because the SIF is bereft of good CCNs and/or RH (which is also diagnosed as low adiabatic condition). Even surface level seeding will stoke such systems. Meso scale systems have high lapse rate. Therefore condensation is prominent pre to collation (as compared to synoptic systems). Rain helps in reducing/interdicting hail events. Therefore AC (even chimney soot) will be better seed-feed(s) compared to FA (i.e., particles viz., anthracite smoke in place of particulates). More condensation means more throw-down. Keeping it balanced and on designate track will be case specific. This will help in inter-crops.

## Swerving a Cyclone

Synoptic scale systems that are heading in the direction of excess rainfall or towards repeat landfall or towards outer sea can be made to swerve in the desired direction by seeding in that particular angle within the SIF field (non-hill geomorphology).

The locations in the FC between position CO→F (B1; Fig-4c) is the most robust part of the FC with firm boundaries i.e., the fluid herein indicate almost unilateral in behavior (cannot be fiddled with). Seeding done between positions CO→F will co-linearise the EIP with line G→D (as in a balanced yo-yo in play motion, Fig.-4b). This will up-regulate synergy within the system and between the various pathways of energy input and their conservation (including rotational speed) i.e., an efficient 'F'. This is particularly relevant when systems having crossed the shore line and need to fjord towards Yamuna plains via the indo-gangetic monsoon trough.

## Tornado Toppling

Odisa is also home to land Tornados. Storms & Tornados inflict severe wanton loss all along the eastern shore board of the Indian sub-continent. The storms being well known historically, have the call name '*kaal baisakhi*' (fluidous killer). We have noted that along the eastern shore board of India the tornado episode window extends from April through to May. They coincide more with hot & dry spacio-temporal conditions of macro scale. Field observation indicates that tornados are also associated with prominent meso scale SIFs, one part (shore side) which is cool & dry and the other part (land side) is hot & dry during system development phase. Thence ground zero is breeze-less, with a strong updraft & plummeting barometer. In our region (coastal Odisa), a dry tornado is also followed by a wet storm in the vicinity. Thence, mushrooming cumulus nimbus type become apparent (soon thereafter) with anti-clock azimuthal arc shift (view from ground zero) and as having a shift along N → S & S → N (view from ground zero). In the case of Andhra-Odisha-Bangla coastal plains, the hot-dry component is from the inland. The cool-dry is from neighboring moist land/shore region sourced (at tide).

Fronts are barocline fault lines (due astronomical input). All fronts seeks homogeneity\equilibrium via displacement. Displacement becauses the torque assisted by the Coriolis. In nature, displacement is non-synchronous, non-linear and is governed by delayed action mechanism. Hence tornados are rare inspite of heat & humid conditions on macro domain scale. Synchronous rapid displacement is the aberration that results in the super swirl alias tornado (micro scale). It is assisted by a mid-day inversion. Therefore, surface wind vanes (with speedometer), thermometers and barometers will be the choice pair of economic simple handy tools. Speed; period and radial perimeter of the SIF, cloud shape, size and arc shift have to be pre-set as thresholds for forecast announcement(s) and resource deployment (for natural disasters, Odisa already has a rapid reaction force. Can be trained to topple tornados).

Therefore, the mechanics of down-regulating land based tornados hold out very different conditions. The observation is that the whole of the tornado also forms its core. Being land sourced they are comprised of dust/particulates/sand/soil and compressed air. Are also (mostly) dry thermal systems in Odia lingua known as *khandia bhuta* (part body). Inducted energy is impressed into the suspended solids (that the tornado up-picks) which in turn makes the system powerful in spite of having a narrow cross section and a unique architecture comprised only of compressed dry gases. Hot-dry\cold-dry fronts are atypical and also are aberrations (conditions on the planet Mars which is waterless, hot and dry has been creating sand storms out there). Tornados are nature's rapidly rotating needle cum thimble that attempts to a stitch\inflict barocline equilibrium in such atypical-front (hot-dry\cold-dry). Hot being the up-ward movement of the air and relative dry cum cold being the lateral movement provides the torque (tangential). Tornados are double drum shape (panava in Sanskrit, which means slim waist). Tornado presents an inversion of therm along its column, with wind velocity & systemic uptake being highest at base. It does have a thin-film SIF on which it floats (it is more ground hugging than the synoptic cyclones). The torque is least at the mid which makes that region the weakest point of the panava column. Tornados are aerodynamically very erect due to energy embedded in the suspended solids and yet are very unstable architecturally. Tornados are short period members that kill, maim and destroy. Therefore, they need to be 'toppled' in an eco-friendly manner (radical intervention).

Figure-8 is the schematic presentation of the isobar character of a tornado at base. There are 10 barometers at a spacing of 10hPa each (i.e., 10 close isobars @10hPa), and works out to a steep gradient of 100hPa with maximum being at flat-ground. The diameter at such base ranges between 25-to-50meters only between position R & F = land Tornado. Position 'G' represents 'genesis', 'F' represents 'front', 'D' represents destination, and its inclination is marked by squeezing of the close isobars which makes the F as a precipice. It is the system's major energy injection point 'EIP', and is inclined towards 'D', is most turbulent and is also moving in that direction. Along line G-D, 1hPa of inter-bar difference may work out to a variable spatial measure between 2-to-10 meters terrestrially (base), between location 'F' and 'R'. Wind velocity and vorticity heighten with squeeze. Vortex imparts lift (via 2$^{nd}$ law of Newton). Thus the ability of lifting things off the ground is highest in the squeeze region. Items that are aerodynamic are the most prone (very low sp. Gravity); items having airways being next (poly wheel vehicles, fish, bovine, and pneumatic loads). 'F' is also the mixing point for the in-situ circulatory flows and the new inductions. This necessitates very high Reynolds (to enable uptake\conserve energy) which in turn seeks the least bottom friction (drag) pathway, and the tornado swivels & swerves accordingly. Regions of least drag is also the preferred pathway. Therefore, 'F' acts as a vertical turbine type i.e., 'front propelled engine' (not rear driven). In other words, 'F' is very dynamic marked as a very efficient up-draft/vertical turbine. It is an intense natural aberration, efficient, synergic, robust and cannot be fiddled with.

The eye (E) may have an terrestrial diameter of 1-3meters only. Systems do not collapse nor explode due to efficient enstrophy, which operates primarily at the slim waist elevations and also via the 'E". Enstrophy in

tornados also proceed horizontally (unique) , specially from the mid centre of the column, which is why, tornados bends at mid-centre (region of enstrophy). In other words, being a hot-&-dry system a radiator component has to be introduced. The system has to be wetted to inflict down-regulation. Spraying with water jets sky wards will also be effective. M. Alamaro et.als., (2007) concept of spraying of water from mobile platforms emerges attractive (albeit for tornados, not for cyclones, neither for storms). The neo injected wet mass will be hurled up and invert the weight balance.

Tornado system are land members, low in moisture (quite dry) logically are light, erect, narrow and tall. There is near absence of radiator mechanism due low on moisture i.e., high desiccation is the cause of fires during tornado episodes. Compression + friction + desiccation attenuates inflammable point. The vertical turbine phenomena (with acute low pressure) makes the tornados light-weight members with heavy lift capacity. In tornados, the central column is partly radio translucent while being not to the visual spectra – due to the wide spectrum in the cross section of the spinning cum suspended solids alongside particulates; vapor and dry air = diffraction. Apart from having greater RPM it is also neither perpendicular, nor is it stationary. Air-dropping into the E is therefore not feasible (although theoretically is attractive) for up-regulation or for down-regulation intervention.

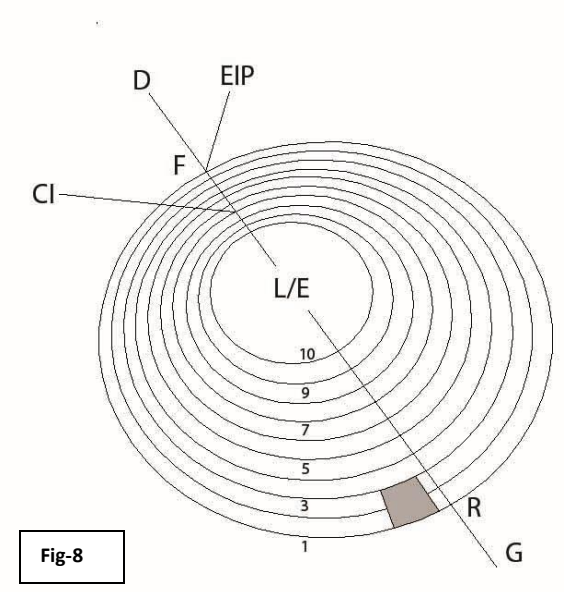



Fig-8

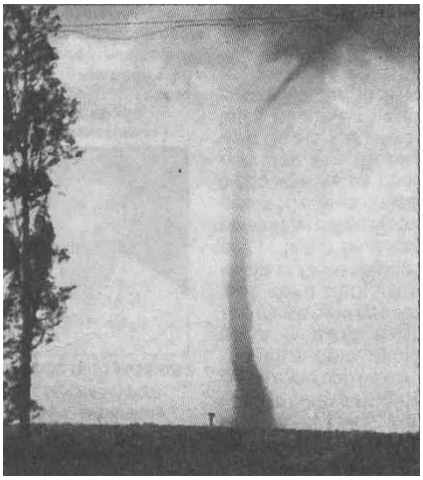


Fig-9

**Fig.- 8: is the schematic representation of the pressure picture below the cloud hood zone of a land tornado. It shows 10 close isobars @10hPa/bar which articulates a conditions of a very severe cyclone i.e., classification far above No.6 as in T-1.**

INDEX **: '***G'= germination locus; 'D' = destination; 'R'= rear; 'L/E' = central radio opaque column & eye; 'F'=front; EIP= energy injection point (the feeder channel/cloud trail joins the system; CL Close isobars – direction of inclination and likely travel.*

**Fig.- 9 : Land Tornado, Ghatikia, Outskrits of Bhubaneswar, See Ref. No. 28. Visible range photograph. Note the weakest point.**

It is near impossible to pre-calculate the swerve of a tornado and the swivel of the F of any tornado in real time (either shift rapidly). There is also sever fatal risk. This leaves 'chasing from the rear' as the sole best route. The rear is marked 'R'. It is the region of the widest inter-bar space (range between 1 : 2 to 1:1.6) and also the least turbulent region of the core zone (CZ). The gray boxed region on the outer barometers is the locus of least relative velocity of the circulatory fluid. It is also the weakest region with the lowest mass (Fig.9). This is the only location which may permit space, time and safety for intervention. The R is also marked by trailing rain. Decay proceeds from the rear. Rain is the radiator. Tornado systems decay precipitously with the rains i.e., along with state change of the compressed fluid mass (conversion of compressible gas to non-compressible liquid). To down regulate such land based warm-dry micro systems, addition of wet mass is called for. So we propose to chase tornados and drop preferably chilled water (or wet near-iced particulates) at about location R and also have high pressure water fountains operating from the ground.

Public & private places\buildings in the US & Indian tornado effected regions that have building atop sensitive and expensive telecommunication towers may affix powerful high thoroughput micronised water jets which all shall auto open with a plummeting atmospheric pressure - as auto rapid reaction devices of down-regulations. Water from the jets will be sucked up, will down regulate wind speed, temperature, and up-regulate rain mechanics. Liquid will experience fractionation and will also provide conditions for generation of fluid boundaries which will deflect the screw (from sensitive establishments\infrastructure).

Land tornados have a *Panava* (slim waist). This is the region where the horizontal component of the thrust of the external fluid field is lower than that what is required to hold the column straight (which is a heavy member). Water will add weight, trigger collation, create pockets of relative vacuum (due to dissolution and droplet formation), dis-regulate system's physical compaction and trigger a toppling mechanics i.e., shear break at mid centre of the vertical column (abrupt end). Further, chilled water will fractionate during free fall stage and shall draw away therm from the neighbourhood and disrupt the efficiency of the enstrophy. The robust central column will fail at about mid-level assisting a topple and/or a crash down.

## Discussion

Down-regulating a very severe cyclonic storm/ super cyclones or tornados are emerging needs. They constitute critical technology. Should our theories withstand critical and applied scrutiny, India and other similarly effected nations may save millions every sever weather season. Will also open windows for fundamental studies and doors of employment opportunities for the youth. Thus is advocated for policy makers & planners. Down regulating any system also translates into fuel and time saving by the international air, maritime transport sectors and above all thwarts disturbances even in unconnected distant lands. These natural events also inflict incalculable loss to finance and insurance service sectors. All such disturbances inflict more deleterious effect on the developing economies.

It is interesting to note, that following our efforts in this direction a concise cum popular *lingua* write up was hoisted by the Manila (Philippines) Cyclone warning centre (www, 2000) and then again by Queensland Geo-Engineering (Bhattacharya, 2011c; Face-book 2012). It is co-incident, that, since then no killer cyclone has made land fall on the Chinese main land ever since the hoisting of our work. We have been given an impression that in such case, our model has been implemented by the Chinese (for public good).

In the Hindu (unshakable of faith) and\or Sanatan (perennial\hydespas) way of life, nothing is done if not done with the *Bhagavat Geeta*. Even the Father of the Indian nation, used to do so. The Sabdakalpadruma (imaginative phyto of phones) the apex lexicon of India, gives the meaning of the term 'nationale' for *Bhagavat*, and 'recitation' for

*Geeta*, respectively i.e., *Bhagavat Geeta = National Recitation*. The Geeta is also given a metaphor prefix '*Srimad*' (apex common opinion).

The *Vedas*, (pre-date the Geeta) use the feminine phone *devi* (bestower) and *vristi* (copious throw down). The *Geeta* uses the techno-abstract term *parjana* (precipitation) which is of *napunsaka linga* (neither masculine, nor feminine). At *sloka* (canto) 3.14 (Figure-9) the *Geeta* says, 'food crops on the surface is possible due to precipitation which in turn is possible by exercise\drill (*yagna'*). This is direct allusion to weather modification. All this is ancient science and hence is secular. It has come down to us. We stand inspired.

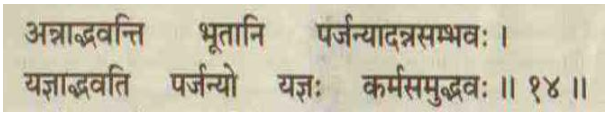

अन्नाद्भवन्ति भूतानि पर्जन्यादन्नसम्भवः ।
यज्ञाद्भवति पर्जन्यो यज्ञः कर्मसमुद्भवः ॥ १४ ॥

**Fig.- 10 : Is the scanned copy of the Hindu Scripture called Sri Bhagabat Geeta. It depicts the canto No.3.14.Sanskrit phone, Devnagari sript**

The epic uses the words *parjana -yagna* (exercise/drill/ human effort induced precipitation) and cites it as a metaphor. It may be relevant to relate for the benefit of the non initiated and the non Hindu scholars, that every erudite scholar of Indology and of Indian literature accept the *Geeta* as the gem of a masterpiece (the *Mahabharata* epic). Every erudite scholar of Hindu theology and specially of philosophy accept the character of Krisna as that of the genius. For every Hindu, Lord Sri Krisna is the peerless-supreme. In our candidate *sloka* (Fig.10) the gem, the genius and the supreme come together. The background being, Lord Sri Krisna on battle field, is extolling a unwilling yet immensely capable general to take to arms to solve the paramount problems of nation-society (unspecified) by blood and steel. To do so, the Lord selectively uses man made weather modification exercise / technique (*yagna*) as his choice metaphor.

The averments herein may be correlated with the fact that if coal (lignite\anthracite i.e., high ash content fossil fuel) based thermal power plants are located on the coast and specially if they be in the system's natural ingression path ways (e.g., Mahanadi or Godavari; Rupnarayan), north east Bihar then there will a up-regulation effect. Because, among the large industries only coal smoke produce the highest amount of rain causing good CCNs. If set up in rain shadow regions they will reduce high floods and top soil loss. Petro-chem units in east Assam will also reduce wasteful rain episodes in the NE. If , petrochemical industries are set up on the shore line in killer cyclone ingression regions, it will lead to down regulation. Because, this type of industries produce the highest amount of rain failing (bad) CCNs. Paradip & Haldia based petrochems will down regulate killer cyclones along with economic bounty. On the other hand, high ash content (Lignite) coal based power plants located in Chitoor; Kadapa; Rayalseema; Telengana; Chattisgarh; Vidharva; Marathwada; Budelkhand; Sauratra; Rajasthan; will be of much help to the agro-met of such rain deficient domains and to the hail storm effected Sutlej-Ganga plains.

## Conclusion

Vis-à-vis sea sourced cyclones, FA sourced form power plants and AC from cinder deposits posit as best candidate pair for inducing weather modification (including up-regulating and down-regulating any system) and inflicting swerve in rain bearing systems. Location 'feeder channel' posits as best locus for seeding operations in killer cyclones. Vis-à-vis land based tornados spraying of micronised water (wetting) will be useful. While cyclones need to be clawed away from the rear and the sides, tornados need to be toppled. Vis-à-vis our caption, principles of fluid mechanics appear attractive. Our understanding (for working out a socially relevant Technology) for down

regulation and up-regulation aspects has (also) arisen out of our two decade long comparative study of the effect of the geography and orography (also tradition & cultural practices).

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