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Research Article

Interface Liquid-Solid: Global Bifurcation Multiparameter of Flow Water Waves through Porous Compacted Granular by "Yakam Matrix"

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ABSTRACT

The construction of the tourbillon balls is fundamentally well known to Constatin and Strauss. In this work, we apply the flow of water through the compacted granular, in order to arrive at a model of passage in confinement and stagnation through the pores. An approach agrees of the advanced theory of water waves and the application of dynamics in microfluidics is discussed to improve "ASEAD Project water for everybody". The approximation solution of nonlinear stochastic partial differential equation for only element of "Yakam Matrix" liquid-solid interface by simple understanding bifurcation behavior will follow the some trajectory of waves of water, granular compaction and dynamics of fluids at all scales, then we are still just at the beginning.

Keywords: Water; Flow; Bifurcation; Multivariable; Granular; Pores; Yakam Matrix

INTRODUCTION

In many cases, we find differential equations and partial differential equations, which justify the different variations of physical, chemical, biological or other phenomena, using five well-known physical states of matter. These are: the solid state (s), the liquid state (l), the gaseous state (g), the plasma state and the colloidal state. These states allowed us to build a matrix called Yakam introduced for the first time in 2007 [1].

We consider the Stokes equation governing the velocity and pressure of an incompressible creeping flow, subject to the gravity, in a domain Ω, open bounded subset of R^d. As the flow is supposed to be sufficiently slow to neglect the advection compared to the diffusion, the momentum balance equation reduces to $-\nabla.\ \sigma=\varrho(x, y, z)g(x,y,z)$

With the stress tensor $\sigma=\tau-pI$ Consisting of a viscous stress tensor τ and pressure term with I the identity matrix of Md (R). The incompressible constraint $(x,,)$=0. Moreover, the relation between liquid and granular through pores of Nano diameters gave supplemented with boundary conditions dΩ. In practice one cylinder with three dimensional in viscid gravity waves at the surface of layer of water with a flat bottom is the build case.

This interface helps the simple Setup, where undisturbed state of flat surface equation is y=0 and the flat bottom is given by y=-d for some d>0. In the presence of waves, let y=n(t, x) be the free surface and let (u(t, x, y, z)), v(t, x, y, z), w(t, x, y, z)) be the velocity field (Figure 1). If P (t, x, y, z) denotes the pressure, P_o the constant atmospheric pressure, and g is the gravitational constant of acceleration, the governing equations [2,3] are:

$$-\left(\frac{\partial q_x}{\partial x}+\frac{\partial q_y}{\partial y}+\frac{\partial q_z}{\partial z}\right)+Q=\rho c\frac{\partial \theta}{\partial t}$$

$$q_x=-k\frac{\partial \theta}{\partial x},\ q_Y=-k\frac{\partial \theta}{\partial y}\ q_z=-k\frac{\partial \theta}{\partial z}$$

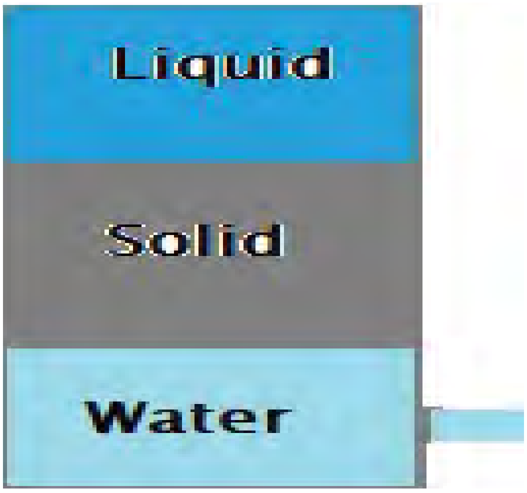

Figure 1: Interface liquid-solid-drinking water.

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Where, k is the thermal conductivity of media. Substitution of Fourier's relation gives the following basic flow equation:

$$\left[k\sum_{i=1}^{N}\frac{\partial}{\partial x_i}\left(\frac{\partial\theta}{\partial x_i}\right)\right]+Q=\rho c\frac{\partial\theta}{\partial t}$$

The specified pressure, volume and ambient temperature are $\theta s=\theta(x,y,z,t)\ on\ S_1$. The specified flow $\sum_{i=1}^{N}q_{xi}\eta_{xi}=-q_s$ on S_2 and the convection boundary conditions is $\sum_{i=1}^{N}q_{xi}\eta_{xi}=h(\theta_{ex}-\theta_{su})$ on S_3.

For coupled phenomena's during interaction near the granular the contact with solid gives $\sum_{i=1}^{N}q_{xi}\eta_{xi}=\sigma\varepsilon\theta_s^4h-\alpha q_r$ on S_4 where σ is Stephan-Boltzmann constant, ε is the surface emission coefficient; α is the surface absorption coefficient and q_r is coming flow per unit surface area. For transient problems it is necessary to specify a pressure field for a body at the time t=0; $\theta(x, y, z, 0)=\theta_0(x, y, z)$.

$$\theta=[N][\theta]$$

$$[N]=[N_1N_2\ldots]$$

$$\{\theta\}=\{\theta_1\theta_2\ldots\}$$

$$\begin{Bmatrix}\frac{\partial\theta}{\partial x}\\ \frac{\partial\theta}{\partial y}\\ \frac{\partial\theta}{\partial z}\end{Bmatrix}=\begin{bmatrix}\frac{\partial\eta_x}{\partial x} & \frac{\partial\eta_y}{\partial x} & ..\\ \frac{\partial\eta_x}{\partial y} & \frac{\partial\eta_y}{\partial y} & ..\\ \frac{\partial\eta_x}{\partial z} & \frac{\partial\eta_y}{\partial z} & ..\end{bmatrix}\{\theta\}=[B]\{\theta\}$$

$$\int_0^v\left(\frac{\partial q_x}{\partial x}+\frac{\partial q_y}{\partial y}+\frac{\partial q_z}{\partial z}-Q+\rho c\frac{\partial\theta}{\partial t}\right)\eta_i dV=0$$

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0$$

$$\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}+w\frac{\partial u}{\partial z}=-Px$$

$$\frac{\partial v}{\partial t}+u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}+w\frac{\partial v}{\partial z}=-Py$$

$$\frac{\partial w}{\partial t}+u\frac{\partial w}{\partial x}+v\frac{\partial w}{\partial y}+w\frac{\partial w}{\partial z}=-Pz-g \quad (1)$$

The boundary conditions for the water wave problem are $P=P_0$ on y=

$$\eta(t,x), v=\eta t+u\eta x \text{ on } y=\eta(t,x), v=0 \text{ on } y=-d \quad (2)$$

Given c>0, we are looking for periodic waves traveling at speed c. The profile η oscillates around the flat surface y=0 and the horizontal fluid velocity u is less than c at every point. For convenience we shall take the length scale to be 2π. Define the (relative) stream function $\psi(x,y,z)$ by $\psi_x=W-V$, $\psi_y=U-W$, $\psi_z=V-W$, with $\psi_x=0$ on the free surface, and let $\omega=\frac{\partial w}{\partial x}-\frac{\partial v}{\partial y}+\frac{\partial u}{\partial z}$ be the vorticity $\Delta\psi=-\omega$. At least locally, away from a stagnation point (a point where u=c, v=d, w=0), ω is a function of Ψ. We will assume that there is a function γ, called the vorticity function, such that $\omega=\gamma(\psi)$ throughout the fluid. Thus, $\Delta\psi=-\gamma(\psi)$. We define the relative mass flux as $p_0=\int_{-d}^{n(x)}\left[u(x,y,z)-c\right]dy$, which is independent of x by (2). Since u<c, po<0. Let $r_p=\int_0^p\gamma(-s)ds$ have minimum value r_{min} for $p_0\leq p\leq 0$. Let $\bar{D}_\eta$ be the closure of the open fluid domain $D_n=\{(x,y,z)\in R^2: x\in \mathrm{R}, -d<y<\eta(x,y,z)\}$. Given as set E with a smooth boundary, define for ∈ N and α ∈ (0,1) the space $C_{per}^{m+\alpha}(E)$ of functions f:$E\rightarrow R$ with Holder continuous derivatives (of index α) up to order m and of period 2π in the x, y and z variables. Our main results are as follows (Figure 2).

THEOREM 1

Let the wave speed c>0, the relative mass flow po<0 and an arbitrary α∈ (0,1) be given. Let y(s) be a $C^{1+\alpha}$ function defined on [0,|po|]

Such that

$$\int_{p_0}^{0}\left[\left(2\Gamma(p)-2\Gamma\min\right)^{\frac{3}{2}}+(p-p_0)^2\left(2\Gamma(p)-2\Gamma\min\right)^{\frac{1}{2}}\right]dp<gp_0^2 \quad (3)$$

And $(s)\geq 0$, $(s)'\leq 0$ in [0,/p_0/]. (4)

Consider traveling solution of speed c of the water wave problem (1)–(2) with vorticity function such that u<c throughout the fluid. There exists a connected set C of solutions (u,,,) in the

Space $C_{per}^{2+\alpha}\,C_{per}^{2+\alpha}\times C_{per}^{3+\alpha}(R)$ appropriated to Sobolev Space for Nonlinear Partial Differential Equation, with the fη ollowing properties.

1. C contains a trivial flow (with a flat surface η=0);

There is a sequence of solutions (u_n, v_n, w_n, η_n) ∈ C for which $\max\overline{D_{nu}u_n}\uparrow c\cdot$

Furthermore, each solution (u,v,w,η) ∈ C satisfies.

1. It is easily that u, v, w, η have period 2π in axis of gravitation z;
2. Within each period the wave profile η has a single maximum (crest) at x=a, say, and a single minimum (through);
3. That u and η are symmetric while v is antisymmetric around the line x=a;
4. $\eta'(x)<0$ on (a, a+π), i.e., the profile of the wave is strictly

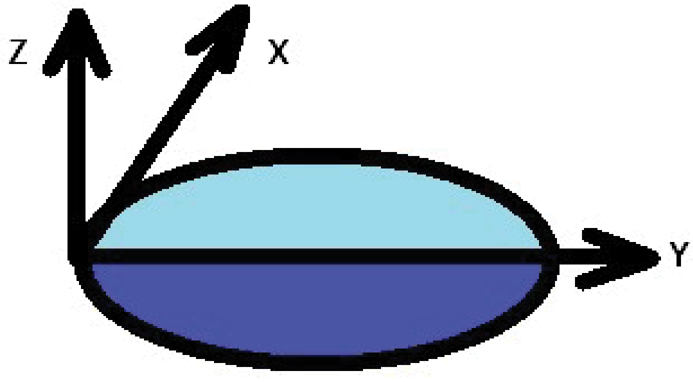

Figure 2: Main results with the x, y and z variables.

decreasing from crest to trough.

THEOREM 2

(i) We make the same assumptions as in theorem 1, except we do not assume (4). Then there exists a connected set C with the same properties as in Theorem 1, except that 5 ii) is replaced by (B*) there is a sequence $(u_{n,})$ at either $\max \overline{D_{nu}\, u_n} \downarrow -\infty$.

DISCUSSION

History of Stokes

In 1847 Stokes [4] studied irrotational periodic traveling water waves and some of their nonlinear approximations. The flat approach was developed Levi-civita [5] and Struik [6]. Nevertheless in this work we construct a global continuum of such regular solutions with general vorticity. After that no other bifurcation point λ^* can have this nodal pattern and the pattern persists all along C the nonlinear boundary condition. We reduce the alternative (a) that C is unbounded in $C_{per}{}^{1+\alpha}$ (R), to the condition that h_p is unbounded in $L^\infty(R)$, then we prove that h is successively bounded in $C_{per}{}^{1+\alpha}(R)$, in $C_{per}{}^{2}(R)$ in $C_{per}{}^{2+\alpha}(R)$, and finally in $C_{per}{}^{3+\alpha}(R)$, in $C_{per}{}^{2+\alpha}(R)$ h_p. Here we use the Schauder estimates and several basic a priori estimates of Lieberman and Trudinger [7] for nonlinear elliptic equation with nonlinear oblique boundary conditions.

APPLICATION

Thus alternatives are reduced to (a*) either h_p is unbounded in L^∞ (R), or (c) C contains in its closure a solution where $\square_p$ vanishes. Then we return to the original problem in the form of the Euler equation. Under assumption (4) we eliminate the last possibility (c). However, (a*) means that max $u_n \uparrow$ c, while (c) means that min $u_n \downarrow -\infty$ for some sequence of solutions.

Compacted granular

Granular matter has been the subject of numerous studies since two last decades [G1-G2] for two–dimensional granular system [G2] and some the propagation of two-dimensional [G3] inviscid gravity waves at the surface of a layer of water with a flat botton.

Many manipulations of granular by compaction to properties powders are well-known, but the manipulation the adhesion liquid onto compacted granular in four different scales: macroscopic scale, mesoscopic scale, microscopic scale and nanoscale is very complex and present the nonlinearity of behaviour waves water onto substrates solid of compacted granular throughout the porous. Interface liquid-solid generate by nonlinear dynamical system. The models developed can help to understand and make predictions about effects induced by multipara meters change such onto during flow liquid, stagnation and flow in porous of granular and amplitude of periodic stimulus. The multi-disciplinary team of scientists and support staff whose aim is to investigate the occurrence of scrapie in the water of world population and to provide advice on the control of penery of drinking water in the future. We do not understand if the complex of element's "Yakam Matrix" can in physical sciences; scientific understanding has been expressed in elegant theoretical constructs and has led to revolutionary technological innovation [8-11]. If the advances in understanding bifurcation behavior of liquid-solid interface of "Yakam Matrix" will follow the some trajectory of waves of water, granular compaction and dynamics of fluids at all scales, then we are still just at the beginning "Yakam Matrix".

The study of networks pervades all of science, from fluids mechanics. The nonlinear dynamics: systems can often be modelled by differential equations dx/dt=v(x), where x(t)=(x1(t), ..., Xn(t)) is a vector of state variables, t is time, and v(x)=(V1(x),..., Vn(x)) is a vector of functions that encode the dynamics.

TERMINOLOGY AND CONCEPTS

$$\frac{\partial \theta_i}{\partial t} = \omega_i + \frac{K}{N}\sum_{j=1}^{N} \sin\left(\theta_j - \theta_i\right),\ i = 1,\dots,N$$

Where $\theta_i(t)$ is the phase of the ith oscillator and ω_i is its natural frequency, chosen at random from a lorentzian probability density $g(\omega) = \frac{\gamma}{\pi\left[\gamma^2 + (\omega-\omega_0)^2\right]}$ of width γ and mean ω_0. Using an ingenious self-consistency argument, Kuramoto solved for the order parameter that $r(t) = \left|\frac{1}{N}\sum_{j=1}^{N} e^{i\theta_j(t)}\right|$ (a convenient measure of the extent of synchronization) in the limit $N \to \infty$ and $t \to \infty$. He found that $r = \begin{cases} 0,\ K < K_c \\ \sqrt{1-\left(\frac{k_c}{k}\right)}\ K \geq K_c \end{cases}$

Where $k_c = 2\gamma$. In order words, the oscillation and stagnation of water through porous of granular are desynchronized completely until the coupling strength K exceeds a critical value k_c . After that, the population splits into a partially synchronized three dimensional state.

$$[j] = \begin{bmatrix} \frac{\partial u}{\partial x} & \frac{\partial v}{\partial x} & \frac{\partial w}{\partial x} \\ \frac{\partial u}{\partial y} & \frac{\partial v}{\partial x} & \frac{\partial w}{\partial x} \\ \frac{\partial u}{\partial w} & \frac{\partial v}{\partial x} & \frac{\partial w}{\partial x} \end{bmatrix}$$

CONCLUSION

The partials derivatives of x, y, z, in respect to u, v, w are found by differentiation of displacement of water through porous of granulars.

$$\frac{\partial u}{\partial x} = \sum_{i=1}^{m}\frac{\partial \eta_i}{\partial x_i}(x,y,z,p,\dots\theta)\ \frac{\partial v}{\partial x} = \sum_{i=1}^{m}\frac{\partial \eta_i}{\partial x_i}(x,y,z,p,\dots\theta)\ \frac{\partial v}{\partial z} = \sum_{i=1}^{m}\frac{\partial \eta_i}{\partial x_i}(x,y,z,p,\dots\theta)$$

$$\frac{\partial u}{\partial y} = \sum_{j=1}^{n}\frac{\partial \eta_j}{\partial y_j}(x,y,z,p,\dots\theta)\ \frac{\partial v}{\partial y} = \sum_{j=1}^{n}\frac{\partial \eta_j}{\partial y_j}(x,y,z,p,\dots\theta)\ \frac{\partial v}{\partial z} = \sum_{j=1}^{n}\frac{\partial \eta_j}{\partial y_j}(x,y,z,p,\dots\theta)$$

$$\frac{\partial u}{\partial z} = \sum_{k=1}^{p}\frac{\partial \eta_k}{\partial y_k}(x,y,z,p,\dots\theta)\ \frac{\partial v}{\partial z} = \sum_{k=1}^{p}\frac{\partial \eta_k}{\partial y_k}(x,y,z,p,\dots\theta)\ \frac{\partial v}{\partial z} = \sum_{k=1}^{p}\frac{\partial \eta_k}{\partial y_k}(x,y,z,p,\dots\theta)$$

$$dV = dxdydz = \left|J\right| dudvdw$$

We limit our investigation in Hilbert-Sobolev Spaces specified by $(\Omega)=\{u \in L^2(\Omega){:}D^\alpha u \in L^2(\Omega),\ 1 \leq \alpha \leq s\}$

For our study $H_0{}^1$ (Ω) is "noyau" of operator of $^1(\Omega)$ in $(\partial\Omega)$ if p=2.

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